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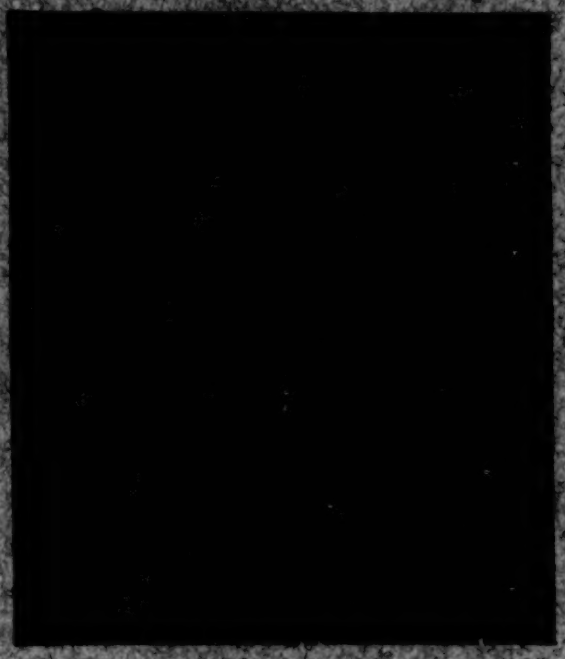

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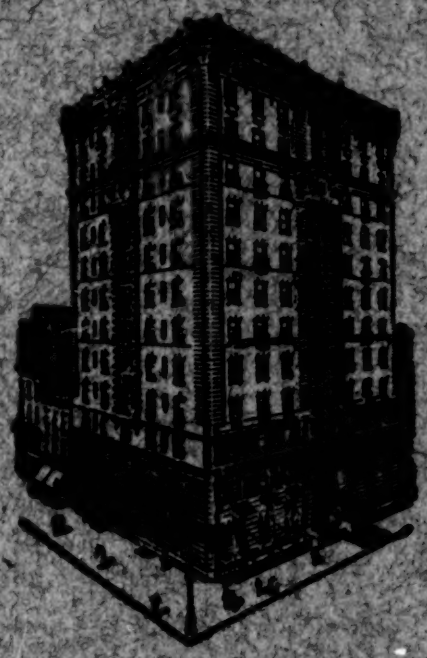

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THE JOURNAL OF
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THE POWER OF THE EYE TO SUSTAIN CLEAR SEEING UNDER DIFFERENT CONDITIONS OF LIGHTING

C. E. FERREE AND GERTRUDE RAND

Bryn Mawr College

The work of which this paper is a brief outline was done under the auspices of the American Medical Association and has been in progress for six years. The object of the work has been to compare the effect of different lighting conditions on the eye and to find the factors in a given lighting situation which cause the eye to lose in efficiency and to experience discomfort.

Confronting the problem of the effect of different lighting conditions on the eye, it is obvious that the first step towards systematic work is to obtain some means of estimating effect. The prominent effects of bad lighting systems are loss of efficiency, temporary and progressive, and eye discomfort. Three classes of effect, however, may be investigated: (1) the effect on the general level or scale of efficiency of the fresh eye; (2) loss of efficiency as the result of a period of work; and (3) the tendency to produce discomfort. A description of tests designed especially for the investigation of these effects has already appeared in print.[1] Some of these tests have been designed to determine the eye's aggregate drop in functional power, others to aid in the analysis of this effect. Space can be taken here for the mention of only one, namely, the one with which the results presented in this paper were obtained. Just two principles are involved in this test. One is that visual acuity or clearness of seeing may be measured by the smallest angle the eye is able to discriminate; the other, a principle equally old, is that a loss of efficiency in a machine, apparatus, or a living organ or organ-

[1] Transactions of the Illuminating Engineering Society, 1913, VIII, pp. 40–60; 1915, X, pp. 1122–1170; Annals of Ophthalmology, July, 1916, pp. 1–3.

ism will show out more plainly when a prolonged rather than a momentary performance is required. These principles in their simplest terms have been combined into a test of the comparative ability of the eye to maintain its power of clear seeing or aggregate functional activity under different conditions of lighting and under different kinds and conditions of use. In operation the test method may be described briefly as follows: The power of the eye to sustain a certain standard of acuity for three minutes is measured before and after a period of reading from uniform type and paper under the lighting conditions to be tested. That is, by means of a visual acuity test-object with the appropriate auxiliary apparatus for its manipulation, and a kymograph and chronograph, records are made of the time the eye can be held up to this standard of performance and the time it drops below. The ratio of these two quantities to each other, or to the total time for which the record is made (3 minutes) is taken as the measure of the ability of the eye to sustain its power of clear seeing before and after the task that is set for it under the lighting conditions to be tested. In the charts appended this ratio is plotted against the time of exposure of the eye to the conditions to be tested to show the relative drop in power to sustain clear seeing under these conditions.

The following aspects of lighting sustain an important relation to the eye: the evenness of illumination, the diffuseness of light, the angle at which the light falls on the object viewed, the evenness of surface brightness, the intensity, and the composition or color value. The first four of these factors, which may be grouped together as distribution factors, will be discussed briefly with reference to types of lighting now in common use.

The ideal condition with regard to the distribution factors, so far as the functional welfare of the eye is concerned, is to have the field of vision uniformly illuminated with light well diffused and no extremes of surface brightness. When this condition is attained the illumination of the retina will shade off more or less gradually from center to periphery, which gradation is necessary for accurate and comfortable fixation and accommodation. In the proper illumination of a room by daylight, we have been able thus far to get the best control of the distribution factors. Before it reaches our windows or skylights, daylight has been well diffused by innumerable re-

flections; and the windows and skylights themselves, acting as sources, have a broad area and low intrinsic brilliancy, all of which features contribute towards giving the ideal conditions of distribution stated above. Of the systems of artificial lighting the best control of the distribution factors, speaking in general terms, is given by the indirect systems, and the semi-indirect systems in which a small portion of the light is direct. In the indirect systems the source is concealed from the eye and the light is thrown against the ceiling or some other diffusely reflecting surface in such a way that it undergoes one or more reflections before it reaches the eye. When properly installed the use of these reflectors introduces no extremes of surface brightness into the field of view greater than that which the eye is prepared to stand without a significant depression of functional power. Moreover, the brightest spots are on the ceiling and are, therefore, in rooms of ordinary height pretty well removed from the zone of most harmful influence on the eye. The direct lighting systems are designed to send the light directly to the plane of work. In the use of these systems there is in general a tendency to concentrate the light on the working plane or object viewed rather than to scatter it in all directions, and therefore a tendency, especially with some types of reflector and kinds of installation, to create brightness differences in the field of vision rather than to level them down. Much can be done to ameliorate this tendency, however, in constructing the reflector and grading its density and in choosing the height of installation above the working plane. Too often, moreover, the eye is not properly shielded from the light source and frequently no effort at all is made to do this, although such neglect is strongly condemned by the more advanced lighting engineers. In fact, how to retain as much as possible of the superior physical efficiency of direct lighting and at the same time to protect the eye from the harmful effects of badly controlled distribution factors more especially from the glare of poorly concealed sources, from the excessive brilliancy presented by the surfaces of reflectors of low density and by the openings of reflectors of high density, etc., is one of the most interesting and difficult problems presented to the workers in this field at the present time. The semi-indirect reflectors are intended to represent a compromise between the direct and indirect reflectors. A part of the light is transmitted

to the plane of work through the translucent reflector placed directly beneath the source of light and a part is reflected to the ceiling. Thus depending on the density of the reflector, this type of lighting may vary between the totally direct and the totally indirect and share in the respective merits and demerits of each in proportion to its place in the scale. By giving a better control of what we have called the distribution factors this type of lighting is supposed also to be a concession to the welfare and comfort of the eye, and so it is in reflectors of high density. Our tests, however, show that the concession is not nearly so great as it was supposed to be in reflectors of low and medium density. In fact, when installed at an intensity of illumination ordinarily used or at an intensity great enough for all kinds of work, little advantage seems to be gained for the eye in this type of lighting with reflectors of low and medium density; for with these intensities of light and densities of reflector, the brightness of the source has not been sufficiently reduced to give much relief to the suffering eye. Moreover, the principles in accord with which the installation is made require that the reflector be brought further into the field of view than is the case, for example, when a direct reflector is used, installed, as is the custom, on the ceiling or as near to it as possible. On this account, therefore, even a worse result is apt to be obtained with semi-indirect reflectors of low and medium density than with equally well designed and well installed direct reflectors of the same density.

In the selection and use of observers for the work the following are some of the precautions that were taken. Care was exercised, in the first place, to choose only those who had already attained a satisfactory degree of precision in other work in physiological optics and whose clinic record showed no uncorrected defects of consequence. All were under 30 years of age. Moreover, before being allowed to take part in the actual work of testing, each observer was trained to a satisfactory degree of precision in the three-minute record under a given lighting condition, and in the three-hour test under several of the conditions to be tested. In the actual work of testing the results were compiled from a number of observations and the precision was checked up by size of the mean variation. No results were accepted as significant unless the variation produced by chang-

ing the conditions to be tested was largely in excess of the mean variation, or mean error, for each condition tested. This, the accepted conventional check on the influence of variable extraneous factors, was carefully applied at each step in the work.

The investigations have not been abstract in character. All the conditions tested were actual lighting situations produced by employing installations in common use.[2] In order that a correlation might be made between lighting conditions and the effect on the eye, the following specification of illumination effects was made in each case. (1) A determination was made of the average illumination of the room under each of the installations of lighting used. The room was laid out in 3 ft. squares and illumination measurements were made at 66 of the intersections of the sides of these squares and at the point of work. The photometric readings were taken in a plane 122 cm. above the floor with the receiving plate of the illuminometer in the horizontal, the vertical and the 45 deg. positions, measuring respectively the vertical, the horizontal and the 45 deg. components of illumination. The 122 cm. plane was chosen because that was the height of the test-object. In the work on the distribution series the illumination for each of the conditions tested was made as nearly as possible equal at the point of work. (2) A determination of the brightness of prominent objects in the room, such as the test surface, the reflectors for the semi-indirect installation, reflectors and filament for the direct installation, the reading page, the specular reflection from surfaces, etc., was made in candle-power per square inch. The brightness measurements were made by means of a Sharp-Millar illuminometer with the receiving test-plate removed. The instrument was calibrated against a magnesium oxide surface obtained by depositing the oxide from the burning metal on a white card. By this method the reflecting surfaces were used as detached test-plates. The readings were converted into candle-power per sq. in. by the following formula: $\text{Brightness} = \frac{\text{Foot-candles.}}{\pi \times 144}$

[2] In all fifty-two different lighting situations have been tested. In addition, miscellaneous experiments have been conducted on the effects of different types of eye shade, the angle at which the light falls on the work, the fatigue of the fixation muscles under different types of lighting, the effect of motion pictures on the eye, etc.

(3) Photographs were made of the room from three positions under each system of illumination.[3]

In the tests for the effect on the eye the following results were obtained: (1) Of the lighting factors that influence the welfare of the eye those that we have grouped under the heading of distribution are apparently fundamental. They seem to be the most important we have yet to deal with in our search for the conditions that give us the minimum loss of efficiency and the maximum comfort in seeing. If, for example, the light is well distributed in the field of vision and diffuse, and there are no extremes of surface brightness, our tests indicate that the eye, so far as the ranges that are apt to be encountered in the work of lighting are concerned, is practically independent of intensity. That is, when the proper control is had of the distribution factors, intensities high enough to give the maximum discrimination of detail may be employed without causing appreciable damage or discomfort to the eye.

(2) For the type of control of distribution effects given by the semi-indirect reflectors of low and medium density, and the direct reflectors presenting an excessive brilliancy due to opening, surface of reflector, or wholly or partly exposed source, our results show unquestionably, that too much light is being used in ordinary work for the comfort and welfare of the eye. That is, with these reflectors means have not yet been found to produce this amount of light without introducing harmful brilliancies into the field of vision.

(3) The angle at which the light falls on the object viewed is an important factor, but not nearly so important, for example, as evenness of surface brightness in the field of vision. Extremes of surface brightness in the field of vision seem to be the most important causes of the eye's discomfort and loss of efficiency in lighting systems as we have them at the present time. In lighting from exposed sources it is not infrequent to find the brightest surface from 1,000,000 to 2,500,000 times as brilliant as the darkest; and from 300,000 to 600,000 times as brilliant as the reading page. These extremes of brightness in the field of vision are, our tests show, very fatiguing to the eye.

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[3] For a full specification of the illumination effects, illumination and brightness measurements, brightness ratios, photographs of room, etc., for all the work that has been done up to this time, see Transactions of the Illuminating Engineering Society, 1913, VIII, pp. 40–60; 1915, X, pp. 407–447, 448–502, 1097–1130.

(4) Of the systems of artificial lighting tested thus far, the best results have been obtained from the indirect systems, and from the semi-indirect systems with reflectors having a high density. By means of these reflectors the light is well distributed in the field of view, and extremes of surface brilliancy are kept within the limits which the eyes are prepared to stand. A great deal of loss of visual efficiency has been found to result, however, from the use of semi-indirect reflectors of low and medium density and from direct reflectors of medium and shallow depth. With regard to the degree of density that is most favorable for the eye, the direct reflectors, we may point out, seem to present a special case. That is, with reflectors of medium depth our best results have been gotten so far with reflectors of medium density. This, however, is not in contradiction to our general principle that extremes of brightness are fatiguing to the eye, as one might at first suppose. For, as a general case, the denser the reflector, the greater is the brightness of the opening. That is, if the physical efficiency of the reflector is not to be lowered by increasing its density, the opening must become brighter in some proportion to the increase of density; for, in a totally opaque reflector all and in the denser reflectors nearly all of the light illuminating the room, as well as that sent directly to the working plane, must come from the opening of the reflector. Moreover, in case of the denser reflectors, the ceiling and the reflectors themselves are dark, while standing out in sharp contrast to them, is the bright opening of the reflector. In the reflectors of medium density, on the other hand, the opening need not have such a high brilliancy and there is little contrast between it and its surroundings. When installed on or near the ceiling in rooms of moderate height, the best results seem to be obtained when the opening, the surface of the reflector, and the ceiling have as nearly as possible an equal brilliancy. It seems probable that the effect on the eye of the denser reflectors can be very much improved by increasing the depth of the reflector and by other devices that will lower the brilliancy of the opening. These devices will be discussed in later work. It will be sufficient here to state that by means of them we have been able to lower the brilliancy of the opening of opaque reflectors of the deep bowl type by amounts that give very good results for the eye without causing a prohibitive loss in the amount of light delivered to the room.

(5) The problem of installing is not the same for the semi-indirect as for the totally indirect reflector. In the latter case the height should be so adjusted as to give as nearly as possible an even distribution of surface brightness, and a uniform illumination on the working plane. In the case of the semi-indirect reflectors, especially those of low and medium densities and in rooms of the height usually found in dwelling houses, if the distance from the ceiling is made great enough to produce these effects, the bright reflectors are dropped too low in the field of view for the maximum comfort and efficiency of the eye. Apparently the denser they are, the more nearly they can afford to be installed as indirect reflectors; and the less dense they are the more nearly they should be installed as direct reflectors—so far as effects on the eye of the kind revealed by our tests are concerned. In this connection, it may be called to mind that in current practice, direct reflectors for general illumination are usually installed on the ceiling or as near to it as possible, especially in rooms low or medium in height.

(6) In the work of providing general illumination, the most difficult feature presented in the problem of protecting the eye is encountered in the lighting of rooms of low or medium height. The difficulty decreases with increase in the height of the ceiling. In rooms whose ceilings are very high in proportion to the other dimensions of the room, it seems safe to say that comparatively good results should be gotten with almost any reflector of modern design; for it is much easier in such rooms to get the bright sources of light, primary and secondary, out of the zone of most harmful influence on the eye.

(7) The loss of efficiency sustained by the eye in an unfavorable lighting situation seems to be muscular, not retinal. The retina has been found to lose little, if any, more in efficiency under one than another of the lighting systems employed (tested by power to discriminate color and brightness, rate of exhaustion and rate of recovery, after as many as ten hours of work under the lighting system in question).

(8) In all of the conditions tested a rather close correlation is found to obtain between the tendency of a given lighting condition to cause loss of visual efficiency and to produce ocular discomfort. The tendency to produce ocular discomfort was estimated by the time required for just noticeable discomfort

to be set up with the eye working and at rest under the conditions to be tested. The results of this work were also carefully checked up by the determination of the mean variation.

Conditions Tested

The tests throughout the work were conducted in a room 30.5 ft. long, 22.2 ft. wide and 9.5 ft. high. In Fig. 1 this room is shown drawn to scale: North, South, East and West Elevations, and Plan of Room. In the Plan of Room are shown by a cross and the appropriate numeral, the 66 stations at which the illumination measurements were made; also the positions of the outlets A, B, C, D, E, F, G and H for the lighting fixtures. In the drawing, East Elevation, one of the positions at which the tests were taken is represented, namely, the one with six reflectors in the field of view. The walls and ceilings of this room are of rough plaster painted a mat white. The floor is of medium dark tiling.

In our choice of the first set of conditions to be tested it was our purpose to make a selection that would give a wide variation in the distribution factors. Three types of lighting were chosen. One may be called an indirect system; one a direct system; and

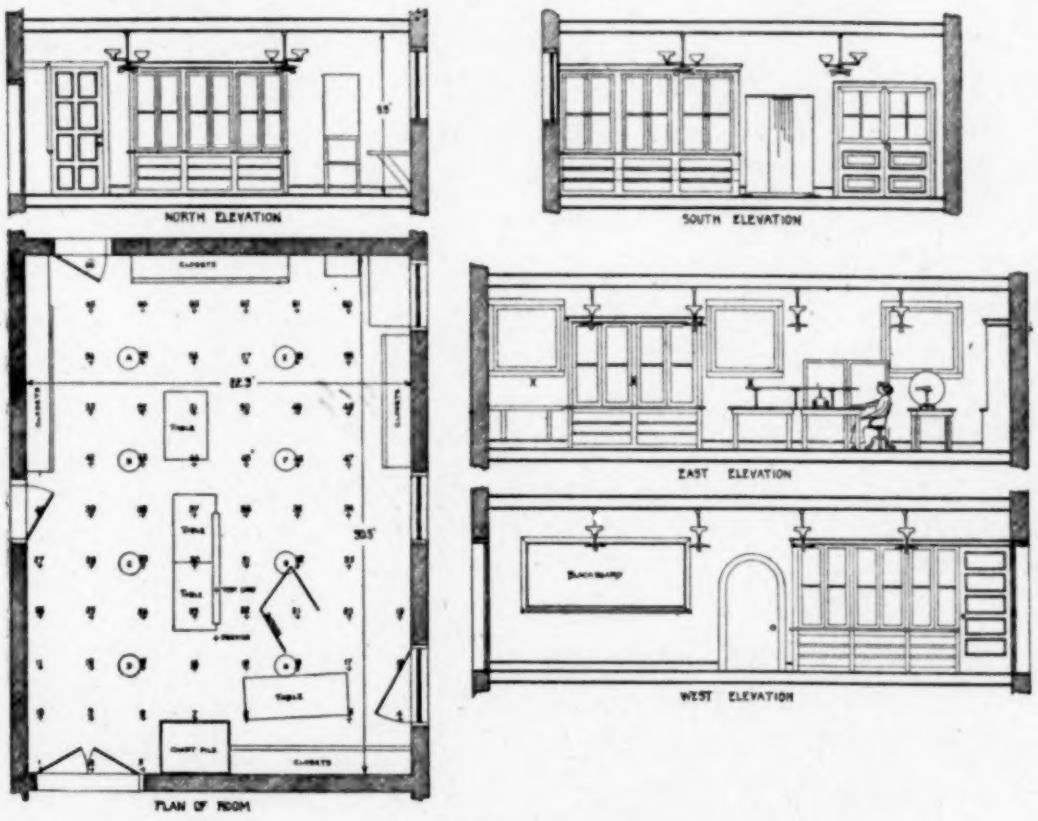


Figure I

one a semi-indirect system. The direct reflectors were not of the most modern make although they may be said to give effects very similar to much of the lighting in actual use at the present time. They were of porcelain ware 16 inches in diameter and only slightly concaved. When placed above the lamps employed, they served merely to distribute the light to the working plane. No protection from the brilliancy of the light source was afforded to the eye. For the semi-indirect system inverted alba reflectors 11 inches in diameter were employed. These reflectors are of modern design and represent very well glassware of medium density. In case of the indirect system corrugated mirror reflectors were used inclosed in brass bowls. These reflectors are also of modern design and give effects which may be taken to represent very well those obtained in good indirect lighting. The tests were taken at four positions in the room,—one with six, one with four, one with two, and one with none of the lighting units in the field of view. The last three of these positions are marked with a cross in Fig. 1, East Elevation. A graphic representation of the results of the tests for the four positions is given in Chart 1. Because of the amount of space that it would require, a tabular statement of results will not be given in this paper.

In the second series of experiments we undertook to determine the most favorable intensities of illumination for the three types of installations we had used in the first series; and in addition the effect of varying the intensity of the illumination with the particular grouping of distribution factors represented in each case. The tests were made in the same room, with the same fixtures, and in general with the same conditions of installation and methods of working as were described in the account of the experiments of the first series. To secure the various degrees of intensity of light needed, lamps of different wattages were employed. In order to keep the distribution factors as nearly constant as possible for a given type of system, the lamps used in making the tests for that type of system were all of one wattage, *i. e.*, were all 15's, 25's, 40's, 60's, or 100's. For the indirect and semi-indirect systems 25, 40, 60, and 100 watt lamps were employed. Our fixtures for the direct system were so installed that either one or two lamps could be used in each fixture, totaling respectively 8 and 16. In order to get a wider range of

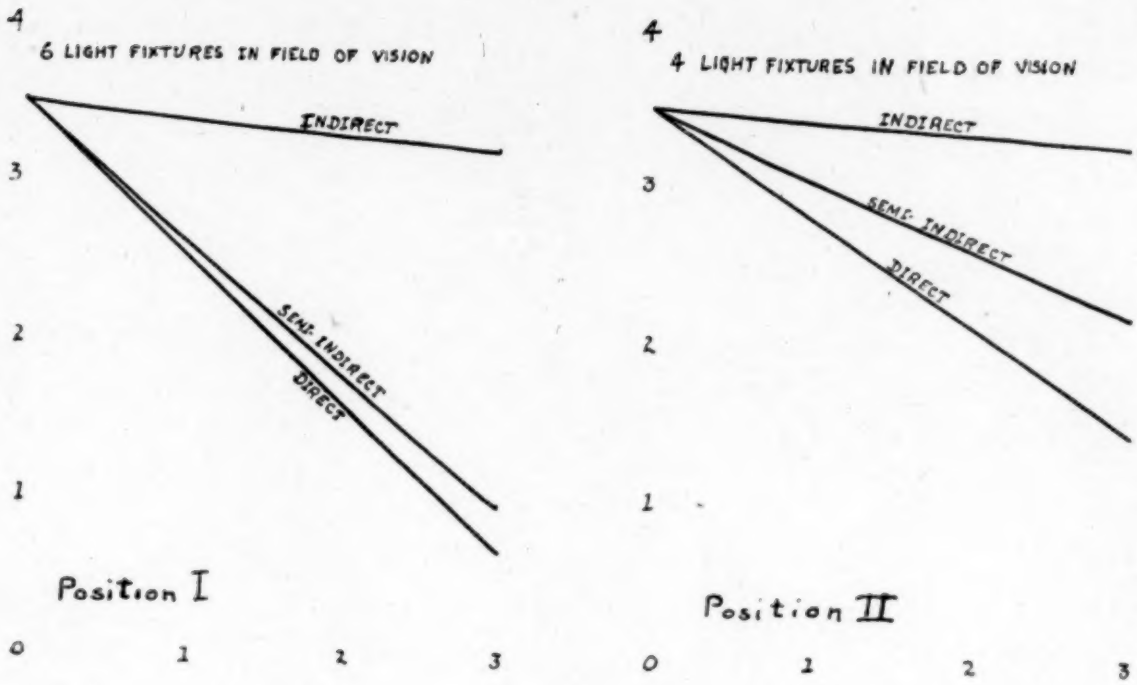


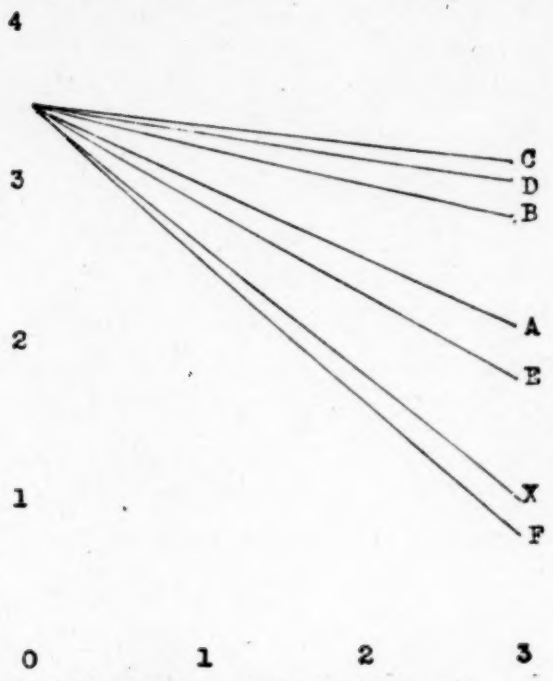
CHART I.

Showing the tendency of the three types of reflector, direct, semi-indirect and indirect, to cause loss of visual efficiency or power to sustain clear seeing; also the effect of varying the observer's position in the room or the number of bright sources, primary and secondary, in the field of view.

intensities both numbers of lamps were used, *i. e.*, one series of tests was made with 8 lamps, and another with 16. Also four intensities of light were employed in each case. These intensities were secured in the 8-lamp system by using lamps totalling 120, 365, 400 and 800 watts. In case of the semi-indirect and indirect reflectors socket extenders had to be used with the 25- and 40-watt lamps. That is, without these extenders these lamps, on account of their smaller size, came so low in the reflectors as to change the distribution effects given by them. For example, without the socket extenders with

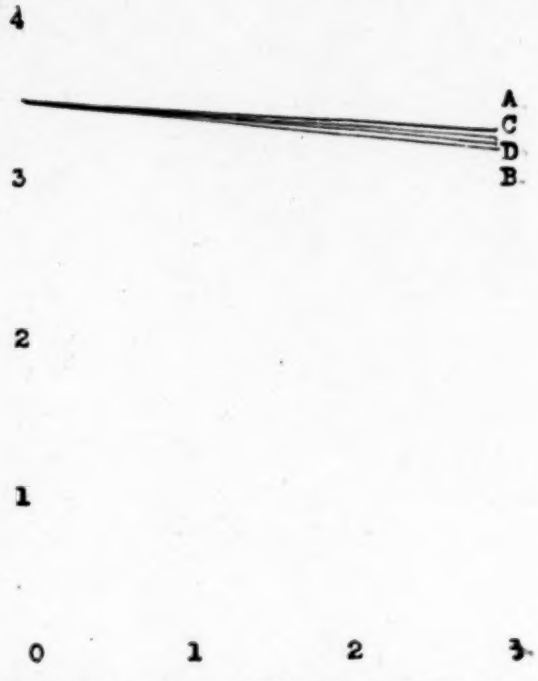
Lighting system: Semi-indirect

	Watts	Volts	Foot-candles		
			Vertical	Horizontal	45°
A..200	107	1.6	0.45	1.15	
B..200	110	1.72	0.484	1.29	
C..320	107	2.2	0.58	1.52	
D..320	110	2.31	0.62	1.61	
E..480	107	3.3	0.94	2.4	
F...800	107	6.8	1.82	4.5	
X..760	107	5.8	1.45	4.0	



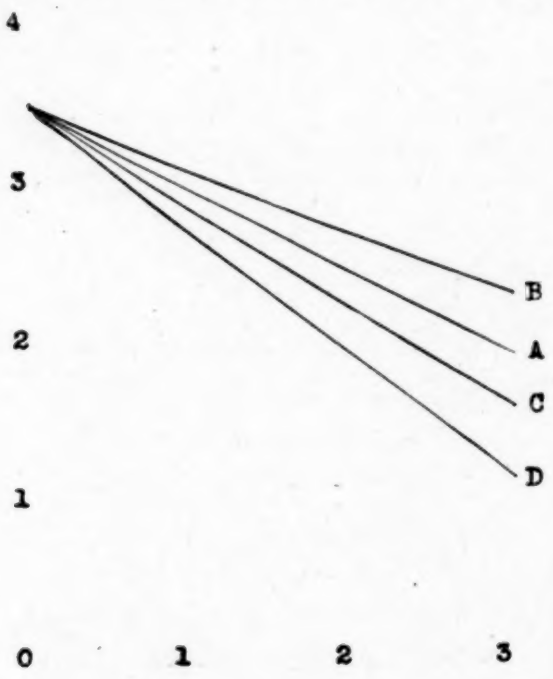
Lighting system: Indirect

	Watts	Volts	Foot-candles		
			Vertical	Horizontal	45°
A..200	107	1.33	0.39	0.87	
B..320	107	1.7	0.49	1.08	
C..480	107	3.0	0.765	1.97	
D. 800	107	5.2	1.36	3.5	



Lighting system: Direct (8 lamps)

	Watts	Volts	Foot-candles		
			Vertical	Horizontal	45°
A..120	107	0.64	0.32	0.49	
B..200	107	1.16	0.45	0.85	
C..320	107	1.97	0.65	1.39	
D..480	107	2.6	1.02	2.0	



Lighting system: Direct (16 lamps)

	Watts	Volts	Foot-candles		
			Vertical	Horizontal	45°
A..240	107	1.23	0.54	0.935	
B..365	107	1.6	0.6	1.33	
C..400	107	1.86	0.8	1.46	
X. 880	107	4.2	1.41	2.6	

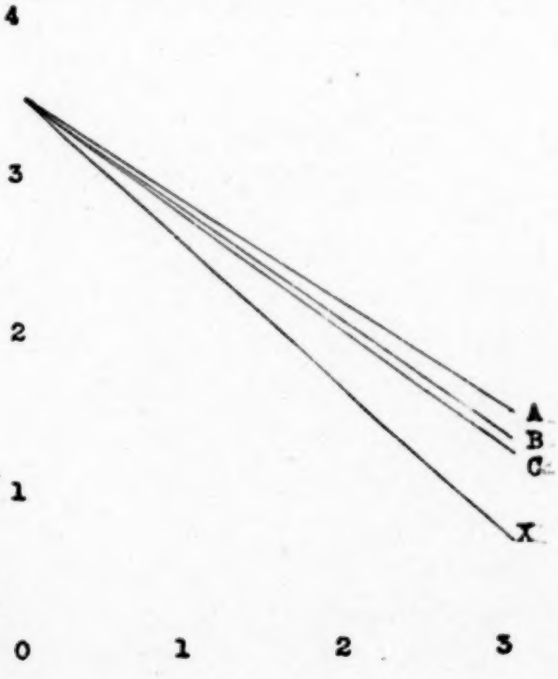


CHART II.

Showing a comparison of the effect on visual efficiency or power to sustain clear seeing of varying the intensity of light for the four installations of lighting used: the indirect, semi-indirect, and direct systems, 8 lamps; and the direct system, 16 lamps.

these shorter lamps, the spot of light on the ceiling, for the indirect system especially, was made smaller and correspondingly more brilliant. It was considered to be a point of interest in relation to the general problem to determine whether this comparatively small change in illumination effects would cause any difference in the eye's ability to hold its power to sustain clear seeing. The results of the tests for the different intensities of light for the three systems of lighting are shown in Chart II. In Chart III is given a comparison of results for the indirect system for the lamps of different wattages with and without socket extenders.

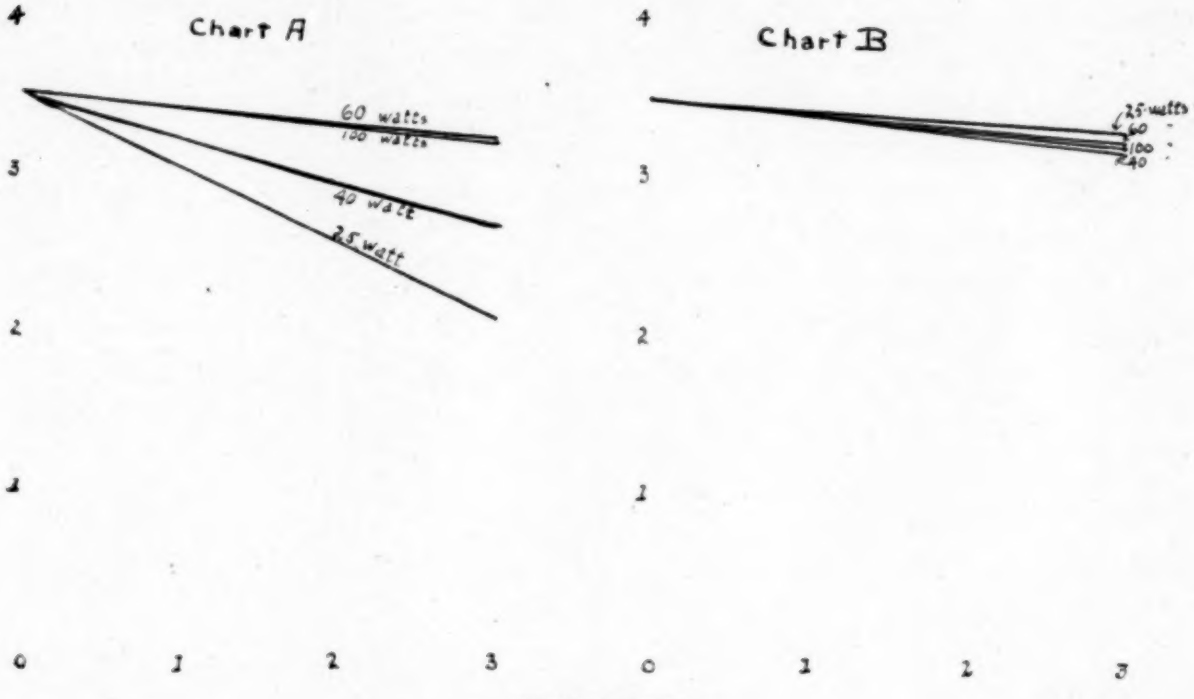


CHART III.

Showing the effect on visual efficiency or power to sustain clear seeing of changing the height of the light source in the reflector of the indirect lighting fixtures. The effect on surface brightness is primarily to change the area and surface brilliancy of the spot of light thrown on the ceiling. Chart A shows the results when height of source in the reflector is changed; Chart B, the results when the height is kept approximately constant.

In the work under the first and second sets of conditions the influence of difference in the distribution factors, more especially surface brightness, was clearly revealed by the use of wide variations in illumination effects. In the third set of conditions much smaller variations were employed. Such differences in effects were included as could be obtained by employing semi-indirect reflectors alone ranging from medium to dense. Six sets of reflectors were used, similar in size and shape and

differing only in density. These reflectors were furnished by the Holophane Works of the General Electric Co., with special reference to the needs and purpose of the investigation. They were all of the bowl type and 8 inches in diameter. Reflector I is a pressed Sudan toned brown; Reflector II a blown white glass toned brown (an experimental product); Reflector III a pressed Sudan; Reflector IV a pressed Druid; Reflector V a blown Veluria; and Reflector VI a blown white glass (also an experimental product). Reflectors I, III, IV and V are commercial products, II and VI are inserted in the series to give gradations in density. These reflectors were installed 30 inches from the ceiling in accord with the principles of indirect lighting. The results for this series of experiments are represented in Chart IV. These reflectors are numbered in order of their density from greatest to least; that is, Reflector I is of the greatest and Reflector VI of the least density. In this connection it is scarcely needful to mention that the greater is the density of the reflector, the lower is the brilliancy of the surface which it presents to the eye.

Type of Reflector	Volts	Foot-candles Horizontal	Vertical	45°
I.....	111	4.1	1.14	2.7
II.....	110	3.7	1.13	2.6
III.....	107.5	4.2	1.16	2.6
IV.....	105.5	3.8	1.15	2.5
V.....	105.5	3.7	1.15	2.6
VI.....	107.5	4.2	1.16	2.7

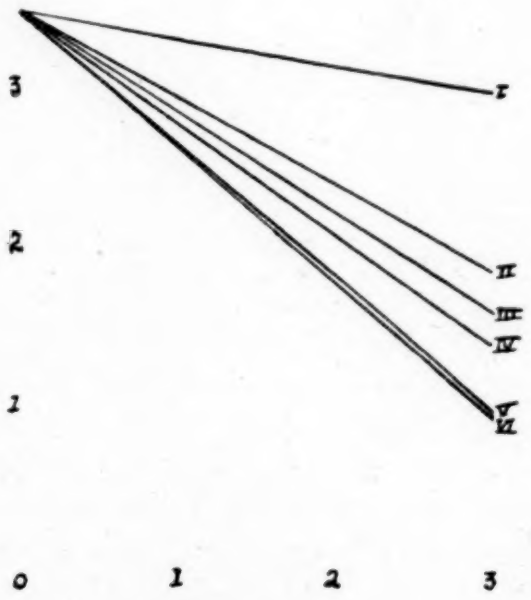


CHART IV.

Showing the tendency of the six types of semi-indirect reflectors to cause the eye to lose in efficiency, or power to sustain clear seeing.

In the tables referred to on a previous page (omitted from this article) we have shown for the sake of completeness of representation the gradation of surface brightness in three ways. (1) Brightness measurements of prominent surfaces have been made. (2) Ratios have been given between surfaces of the first, second, third, etc., order of brilliancy, and surfaces of the lowest order of brilliancy; and between surfaces of the first, second, and third order of brilliancy and the brightness at the point of work. And (3) the mean variation from the average and the percentage of mean variation have been shown. In the consideration of these specifications a number of single items might be selected as of possible significance in relation to the effect on the eye. Among these may be mentioned the order of magnitude of the highest brilliancies; the average brilliancy;

Type of Reflector	Volts	Foot-candles Vertical	Horizontal	45°	Candle-power per square inch
I....	111	4.1	1.14	2.7	0.264
II...	110	3.7	1.13	2.6	0.361
III...	107.5	4.2	1.16	2.6	0.392
IV...	105.5	3.8	1.15	2.5	0.614
V...	105.5	3.7	1.15	2.6	0.848
VI...	107.5	4.2	1.16	2.7	0.920

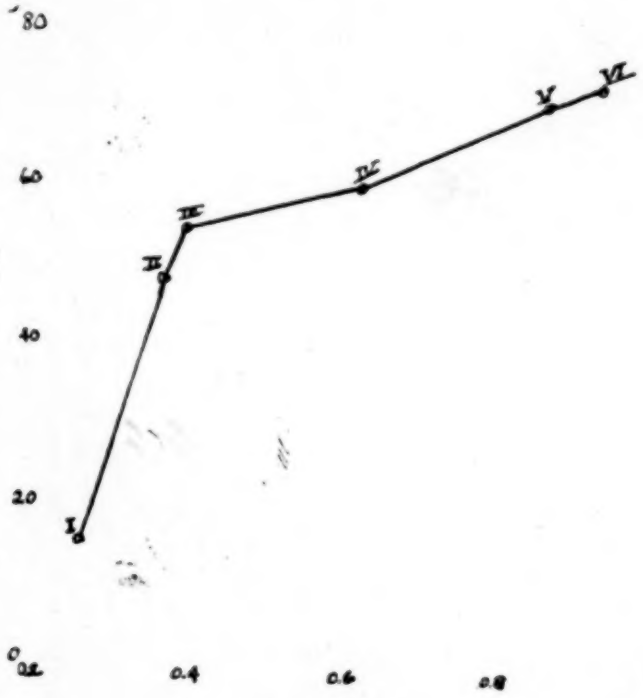


CHART V.

Showing the tendency of the six types of semi-indirect reflectors to cause the eye to lose in efficiency, or power to sustain clear seeing. Percentage drop in ratio time clear to time blurred is plotted against brightness of reflector in candlepower per square inch.

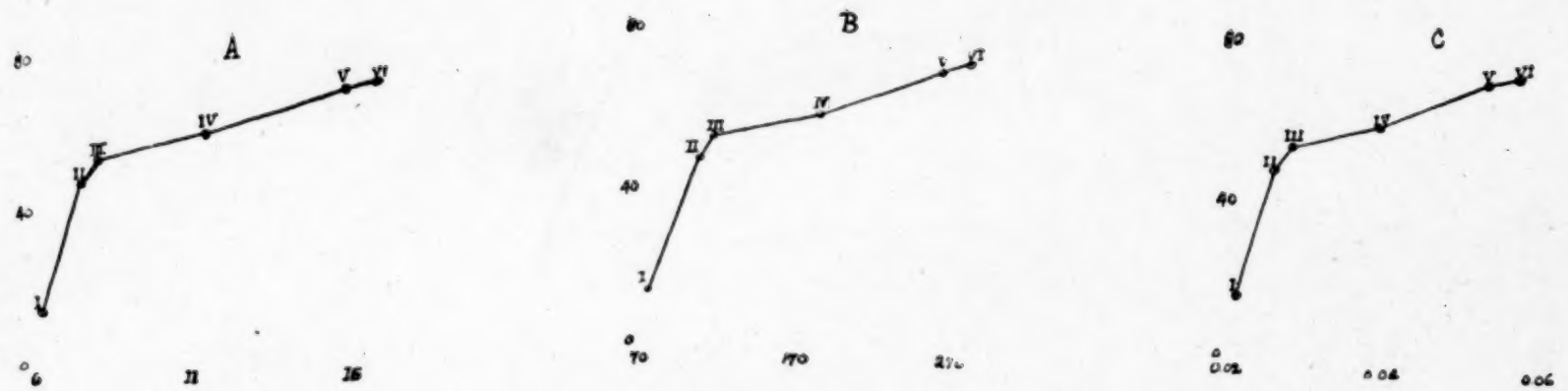


CHART VI.

Showing the tendency of the six types of semi-indirect reflectors to cause the eye to lose in efficiency, or power to sustain clear seeing. In Curve A, percentage drop in ratio time clear to time blurred is plotted against ratio of average brightness to brightness at the point of work; in B, against ratio of lightest surface to brightness at the point of work; and in C, against average brightness.

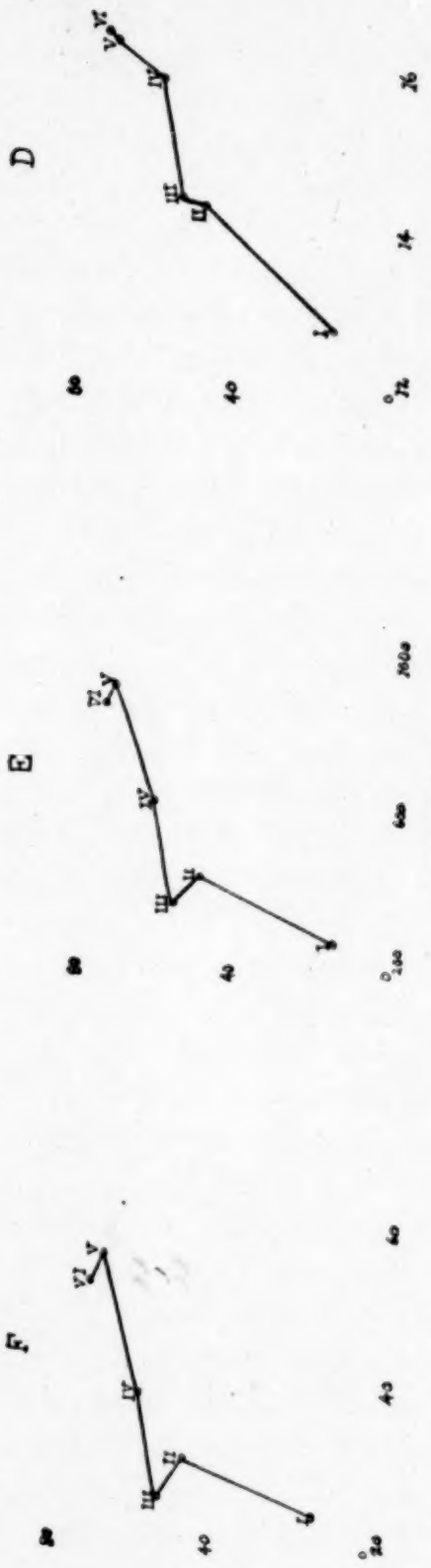


CHART VII.

Showing the tendency of the six types of semi-indirect reflectors to cause the eye to lose in efficiency, or power to sustain clear seeing. In Curve D percentage drop in ratio time clear to time blurred is plotted against ratio of lightest surface to average brightness; in E, against ratio of lightest surface to darkest surface; and in F, against ratio of average brightness to darkest surface.

the ratio of the highest to the lowest order of brilliancy; the ratio of the highest order of brilliancy to the brilliancy at the point of work (brightness of test-object and reading page); etc. In order to see which of these correlate most closely with the results of the test, curves have been constructed in which some of these features are plotted against the results of the test. These curves are given in Charts V–VII. In Chart V percentage loss of visual efficiency is plotted against the highest order of brilliancy, namely the brightness of the reflector. In Charts VI and VII are grouped the remainder of the curves.

In the fourth series of experiments it was decided to use the same density of glassware as was used in the third and to install the reflectors in accord with the principles of direct lighting. It was decided also to supplement this series by experiments with totally opaque reflectors with different linings and of different designs and depths, and with the prismatic glassware. In all fifteen different types of reflectors are being used in this series. The investigation is still in progress. No attempt will be made, therefore, at this time to give a detailed statement of results. An account of the work will be given in a later paper.

THE EFFECT OF EXTERNAL INCENTIVES ON IMPROVEMENT

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Western Reserve University

It is generally agreed that a close relationship exists between interest and effort in all types of mental work. The present attitude towards this relationship is altering the contents of the curriculum and the form of instruction. Two methods of stimulating effort may be contrasted in their extreme form:

(1) That in which an appeal is made to the interest of the subject itself by showing the pupil its close relationship to some dependent and desired activity,

(2) That in which there is a resort to the use of rewards or incentives which are external to the process itself.

No one doubts that the so-called direct interest is superior to that which is artifically stimulated by reward which has little to do with the actual process. While it is not the business of an experimental study to consider the philosophy of this method, it may be pointed out that the justification of the use of the latter means of stimulating interest in the classroom is, that many of the processes especially in their initial and mechanical stages, do not make a direct appeal to the large number of pupils who have only a moderate degree of intellectual interest. In this case in which the work is performed with an external aid, it is the natural hope that the interest which first attaches to the reward will transfer to the process itself. Moreover, external incentives need not of necessity interfere with the direct interest. It is a mistake to banish from the schools a sound method, because in its extreme form that method may lead to abuse. Certain authors who depreciate the use of any artificial incentives, in the nature of external rewards and punishments, nevertheless, take the general position that the schools should reproduce the sound methods of the outside world. It is difficult to see that a method which is such a driving-power in the life of society should have no application in the schools. As adults, all except the chosen few are quite ready to admit that the external rewards of their work are by no means negligible in their motivation. It is conceivable that we are hypocritical enough

to expect children to work from higher motives than those by which we ourselves are actuated.

The first question that arises in connection with this subject is the extent to which an increased interest stimulates an increased effort. Is this degree exaggerated or minimized in the minds of those who are in charge of instruction? It is to throw light on this question that the present study of the relation between incentive and rate of improvement has been undertaken. It is of course impossible to estimate scientifically the amount of incentive employed in the same way as we can measure the product produced. For this reason the present study, though quantitative on the side of measuring the improvement, is of necessity merely descriptive on the incentive side. We cannot say that x additional units of incentive produced an increase y in product, but we can say that a group under such and such external conditions improves at this or that rate. The question however is of such importance, that in spite of this lack of quantitative treatment, it is worth investigation.

The general method of the experiment was to give extended practice in three tests to two similar groups of children, one group working under the normal conditions of the classroom, while the other was motivated by external incentives.

The subjects for this study were: thirty-six boys and girls from grade 5A in the Cleveland Observation School. The following tests were used in the experiment to measure the rate of improvement:

I. The Simple Addition Test used by Thorndike.[1]

II. The Cancellation Test, described by Woodworth and Wells.[2]

III. The Digit Symbol Test where figures are substituted for numerals.

The initial efficiency of the subjects of the experiment was measured in the three tests. They were then divided into two equal groups on the basis of their initial scores in the Addition Test. These groups were not exactly balanced in the final results, because some of the original subjects were absent. The final data were furnished by sixteen individuals in each group. The periods allowed each day were ten minutes for the Addition

[1] American Journal of Psychology, Vol. 21, 1910, p. 483.
[2] Association Tests Psychology Monog., Vol. XIII, No. 5.

Test, one minute for the Cancellation Test, and five minutes for the Substitution Test.

The tests, as well as the basis of scoring were explained in detail. For each addition, cancellation and substitution, one point was allowed; for an omission or error a point was subtracted. The papers were distributed face downward, and an opportunity was given for questions to be asked. This was followed by the signal to commence work. After the preliminary trial, the tests were administered on nine successive days omitting Saturday and Sunday. In this way the curves of improvement were obtained, extending over ten periods. It may be added that the same experimenter administered the tests on all occasions to both groups.

One group, referred to in this paper as Group A, received the external incentives to be described later; the other, Group B, received no external incentives apart from the fact that they were informed of the number of errors made in addition. Thus, while Group B was stimulated merely by the novelty of the test, the interest in the work and the fact that it was done under conditions of serious school work, Group A had all these incentives in addition to the following:

(1) Each individual's results of the previous day were published.

(2) On sheets presented for the day's work, the point reached on the last occasion by the subject was marked in heavy blue pencil.

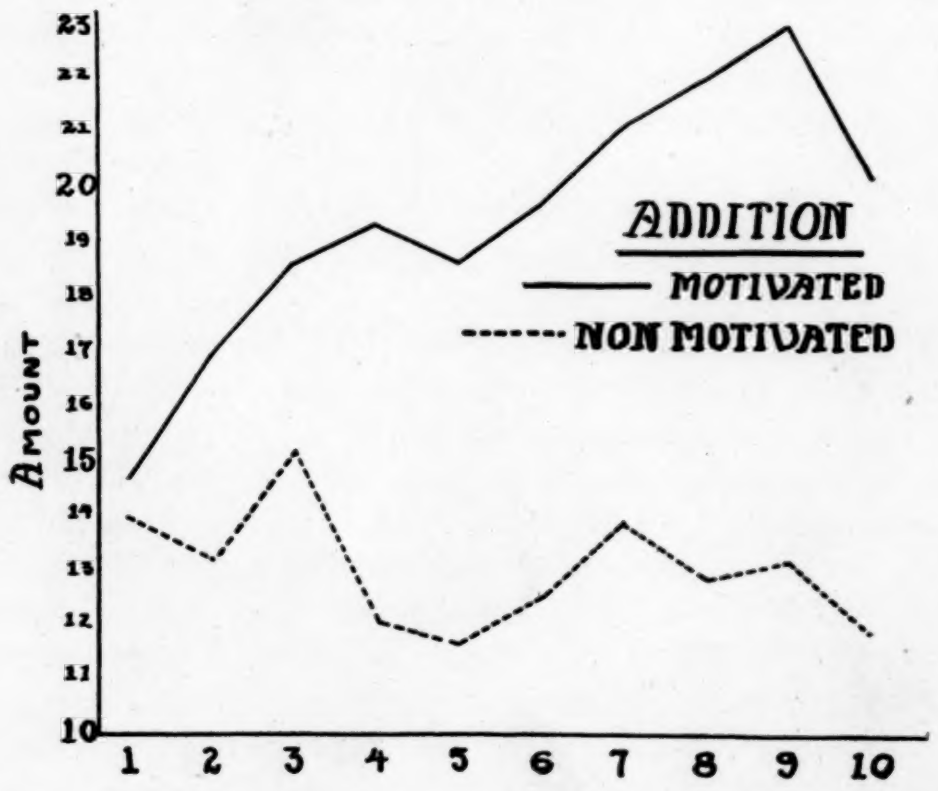
(3) The general improvement of the class was presented in the form of a graph.

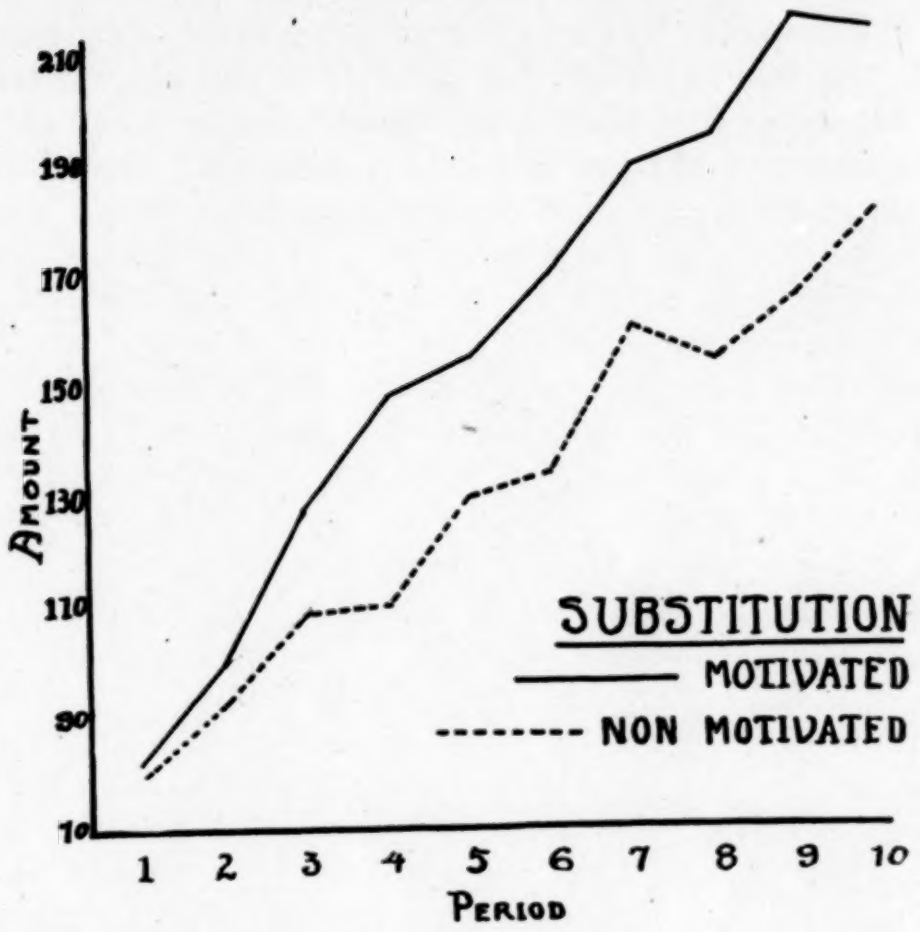
(4) Credits were given in the form of stars, (a) to those who, as regards product produced on the previous day, were in the upper fifty per cent. of the class; (b) to those who, as regards amount of gross improvement, were in the upper fifty per cent. of the class. It was understood that prizes of a merely nominal value were to be given at the end of the ten practice periods to the fifty per cent. in Group A which had gained the greatest number of stars for efficiency and improvement.

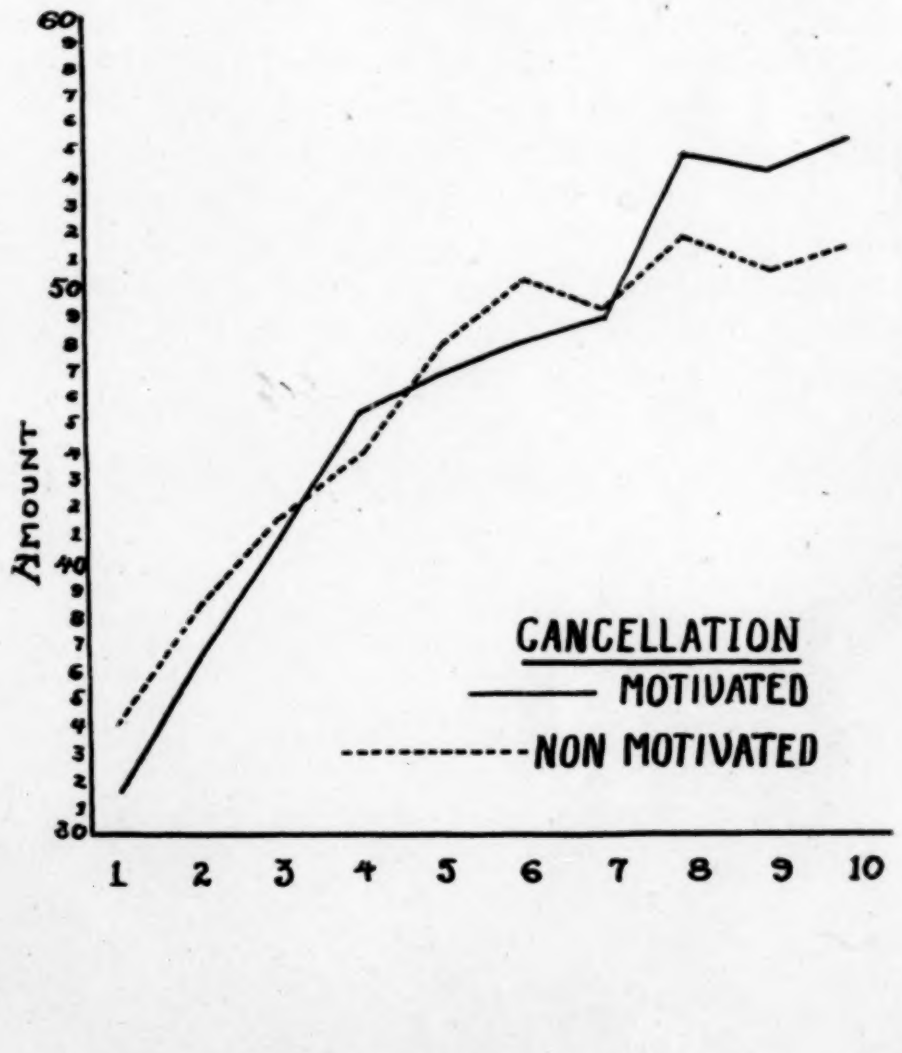
In the following table the average results are presented. The scores in every case are corrected for errors on the basis explained previously. The number of individuals in each group for which the data are presented is sixteen.

Function	Group	Average Score During Period										Average S. D. of columns 1, 5, 10
		1	2	3	4	5	6	7	8	9	10	
Addition (10 mins.)	Motivated	14.7	16.9	18.6	19.3	18.6	19.7	21.1	22.0	23.0	20.2	10.4
	Non-motivated	14.0	13.3	15.2	12.0	11.7	12.5	14.4	12.8	13.1	11.9	6.1
Substitution (5 mins.)	Motivated	81	100	128	148	155	171	191	196	217	215	33.6
	Non-motivated	79	92	108	111	130	139	161	155	166	181	46.0
Cancellation (1 min.)	Motivated	32.0	36.4	40.8	45.2	46.8	48.0	48.8	54.9	54.1	55.2	7.3
	Non-motivated	34.0	38.2	41.6	44.0	47.9	50.1	49.1	51.9	50.6	51.2	10.6

These results are presented graphically in figures 1–3:




210
190
170
150
130
110
90
70
AMOUNT
1 2 3 4 5 6 7 8 9 10
PERIOD
SUBSTITUTION
MOTIVATED
NON MOTIVATED


60
50
40
30
AMOUNT
1 2 3 4 5 6 7 8 9 10
CANCELLATION
MOTIVATED
NON MOTIVATED

From the nature of the experiment and the range of individual difference in the class, the probable error of each isolated value in the table is somewhat great, but the general trend of the results shows that the incentive exerted a considerable effect on the amount of the product. It is significant that it is only in the cancellation test that the non-motivated group improves to the same extent as the motivated. In interpreting this cancellation result, it should be remembered that the length of practice over the ten periods was only ten minutes. We should not expect therefore the novelty of the test to wear off. It was only necessary for the subjects to do maximum work on each occasion for a single minute. This apparently can be accomplished without external incentives. It is when we come to the other tests which require more lengthy periods of work, that we notice the difference in the gain. In the substitution test there is five minutes of novel work, in the addition test there is ten minutes of work which is very similar to the ordinary school routine. We should therefore expect the improvement in the motivated group to exceed the improvement in the other group less in cancellation than in substitution and less in substitution than in addition. This is found to be the case, in fact in addition the non-motivated group actually falls off in efficiency. When we consider that the ordinary school work demands continuous effort over long periods of time, with but little zest of novelty, it may be surmised that the necessity of motivating the work becomes increasingly great. If such large results are found over short periods of work of fifty and one hundred minutes, what must be the failure to secure maximum effort when the work extends over fifty or a hundred hours.

This research has investigated the effect of external incentives; it is desirable that investigation be made, if possible, of rates of improvement when the material of the work is interesting by reason of its relation to some desired activity of the group. This problem it is hoped may be attacked quantitatively later.

A DETAILED STUDY OF WHIPPLE'S RANGE OF INFORMATION TEST

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Brooklyn Training School for Teachers

In a test of size of vocabulary, such as that of Kirkpatrick[1] or Terman,[2] the words are selected in systematic order from an extensive word list (in these cases a small dictionary), and the size of the individual's vocabulary is assumed to be proportional to the number of words of the selected list which are correctly defined. The selection is made on a strictly numerical basis, and is assumed to be representative of the entire list. In Whipple's Range of Information Test,[3] which is a form of vocabulary test, the one hundred words of the test list are selected on an entirely different principle. From each of one hundred fields of human knowledge a word is selected of such basic significance that anyone at all conversant with the work of that field would be apt to know it, yet so technical that it could scarcely be defined on the basis of general information. Thus each word is supposed to be fairly representative of its field, and familiarity with the word would indicate a considerable acquaintance in that field. For example, "vantage-in" represents tennis, "Bernard Shaw," modern dramatic literature, "puer," Latin, "luff," sailing, "guimpe," dress-making, and "kilogram," the metric system.

The method of procedure used in the present study of this test was that recommended by Whipple, and printed on the test sheets. The test was given to an entire class at one time, and the students were asked to place before each word one of the following letters: D, if the word could be defined exactly, as in a dictionary; E, if an exact definition could not be given, but the word could be explained well enough to give some idea of its meaning to one who was not familiar with it; F, if the word was merely roughly familiar, and could not be used intelligently;

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[1] E. A. KIRKPATRICK. *A Vocabulary Test.* Popular Science Monthly, 70: 1907, 157–164.

[2] L. M. TERMAN AND H. G. CHILDS. *A Tentative Revision and Extension of the Binet-Simon Measuring Scale of Intelligence.* Journal of Educational Psychology, 3: 1912, 205–208.

[3] G. M. WHIPPLE. *A Range of Information Test.* Psychological Review, 16: 1909, 347–351. Also in Manual of Mental and Physical Tests, first edition, 1910, p. 465, and in the second edition, 1915, Part II, p. 317.

and N, if the word was entirely new or unknown. The students were told in advance that they would be asked to define or explain some of the words marked D or E, and when they had finished marking they were told to write on the back of the sheet the definitions of the first three words marked D. No use was made of these written definitions in computing the results, and the object in asking for them was merely to induce an attitude of care and accuracy in the marking. The score is, therefore, an indication not of what the subjects actually know, but of what they think they know. In some cases probably advantage was taken of this, and the papers were deliberately marked too high. In the vast majority of cases, however, the students were perfectly honest, and the scores represent accurately their own opinions of their familiarity with the words. Their actual knowledge is somewhat lower than the markings indicate, for casual testing shows that from two to five words marked D or E on each paper prove to be instances of false association when the definition or explanation is given. Thus the score represents the upper limit of the subject's possible range of information, rather than the actual attainment.

The only published records of the use of the test are those by the author of it and by Miss Laura L. Smith,[4] of the University of Texas. Neither of these writers gives more than the average number of D's, E's, F's, and N's for each group of students tested. The present writer was so fortunate as to have access to Miss Smith's original test sheets through the kindness of Professor C. S. Yoakum. To these were added records from 28 seniors and 157 freshmen, making a total of 81 seniors, 59 juniors, 84 sophomores and 372 freshmen, or 596 students in all.

The object of the present study was to ascertain how each group of students responded to each word of the test. To do this the total number of D's, E's, F's and N's was computed for each word and for each group of students. Then arose the problem of reducing these numbers to a single numerical value for each word. After experimentation with various forms of weighting and correspondence with Professor Whipple, it was decided to adopt his suggestion of letting D equal 1, E equal 1, F equal .5, and N equal 0. This method of weighting seems

[4] LAURA L. SMITH. *Whipple's Range of Information Test.* Psychological Review, 20: 1913, 517–518.

to do violence to the distinction which the students were asked to make between D and E, and in all probability the mark E represents a lower degree of certainty about a word than the mark D. Objectively, however, it was found practically impossible to distinguish between definitions and explanations, and in the absence of more definite knowledge it was thought undesirable to burden the computations with a more complicated system of weighting. These weighted scores were then expressed in per cents. of the total possible score. The scores in Table I may therefore be interpreted as percentages of familiarity as judged by the students.

The words in Table I are arranged in the order of decreasing familiarity according to the combined scores of the entire body of 596 students. The preponderance of freshmen in this number tends to make these scores unduly low, since the freshmen scores are considerably lower than those made by the other classes. Perhaps a fairer indication of the performance of college students in general would have been given by combining directly the percentages obtained by the four classes. It will be noted that the senior scores are invariably higher than the average, and as high as or higher than the junior scores in all but eleven cases (puer, way-bill, triangulation, nada, pyramidal tract, undistributed middle, Babcock test, midiron, f-64, amphioxus, and Elohim). Several of these are undoubtedly due to the fact that the juniors had recently been working with such subjects as psychology, logic, and biology. The juniors and sophomores are the closest together of any of the classes. While the juniors are somewhat superior in the aggregate, they surpass the sophomores in only sixty out of the one hundred words. The freshmen surpass the sophomores in only seven words (kinesthetic, peneplain, Chartism, golden section, gneiss, mitosis, and impetigo). In some of these we may see the effect of recent studies in geology, history and biology. In nine words (X-ray, hydraulic press, nada, peneplain, gasket, midiron, f-64, chamfer, and midiron) the four classes are fairly close together. All but two of these words (nada and peneplain) depend upon general experience rather than upon college studies. With terms like Utopia, Caedmon, Les Miserables, Bernard Shaw, dryad, kinetic, cosmogony, etc., on the other hand, the seniors have advanced far beyond the freshmen. That stoicism ranks

TABLE I.

Familiarity of Test Words.

	596 Students	81 Seniors	59 Juniors	84 Sophomores	372 Freshmen
1. X-ray	97	99	98	98	96
2. kilogram	91	96	91	92	90
3. quadratics	87	96	90	92	85
4. Utopia	86	99	95	94	80
5. Stoicism	85	98	94	95	79
6. R. S. V. P.	82	91	86	83	79
7. hydraulic press	77	80	77	79	76
8. cotangent	77	92	83	88	70
9. Caedmon	76	96	89	95	65
10. Les Miserables	76	98	92	92	65
11. chlorine	74	83	75	73	73
12. puer	74	79	82	83	69
13. clearing-house	73	84	83	75	69
14. base-hit	70	77	77	74	67
15. natural selection	70	93	83	76	62
16. entree	68	84	72	74	63
17. wigwag	68	77	75	67	65
18. Euclid	68	94	82	77	58
19. spoils system	67	86	74	70	62
20. simony	67	71	69	80	63
21. electrolysis	67	78	70	68	63
22. Anthony Wayne	64	78	62	66	60
23. Bernard Shaw	62	90	72	64	55
24. calorie	62	74	65	64	59
25. Zionism	60	82	80	74	48
26. f. o. b.	57	66	57	57	55
27. kinesthetic	56	87	76	42	51
28. impressionism	56	79	57	59	51
29. synecdoche	55	74	73	71	45
30. guimpe	55	67	55	59	51
31. linotype	54	65	62	56	51
32. dryad	54	78	66	56	46
33. Millet	52	67	43	58	49
34. tort	49	67	62	60	40
35. kinetic	48	74	52	59	39
36. Polonius	48	72	50	51	41
37. way-bill	47	57	63	51	42
38. triple-expansion	46	53	51	46	43
39. catalepsy	41	65	57	49	32
40. ohm	41	51	39	49	38
41. triangulation	40	49	53	43	36
42. vantage-in	39	57	50	43	32
43. nada	39	39	43	47	37
44. chromosome	38	46	42	47	33
45. call-loan	38	57	52	42	29
46. dietetics	37	56	38	47	32
47. pyramidal tract	35	44	50	35	31
48. metacarpal	34	52	60	39	24
49. peneplain	32	33	30	30	32
50. Pestalozzi	32	70	42	42	19

TABLE I (*Continued*)

	596 Students	81 Seniors	59 Juniors	84 Sophomores	372 Freshmen
51. glycogen	31	46	50	42	22
52. testudo	31	45	41	42	24
53. annealed	31	46	39	34	25
54. dibble	29	38	30	36	26
55. cosmogony	28	57	41	37	18
56. undistributed middle	28	45	54	30	19
57. morgen	28	54	35	28	20
58. Babcock test	25	32	37	29	21
59. aujourd'hui	23	39	27	26	19
60. parallax	22	36	24	34	16
61. Chartism	22	38	25	17	19
62. golden section	21	30	20	16	21
63. gasket	21	23	23	23	19
64. gneiss	21	35	21	17	18
65. infusoria	21	30	29	29	16
66. Bokhara	20	37	19	23	16
67. scherzo	20	35	25	22	16
68. mitosis	19	33	28	11	17
69. architrave	19	44	17	26	12
70. Kepler's law	19	35	34	25	12
71. logos	18	47	36	23	8
72. Eocene	18	46	32	20	9
73. apocalypse	18	41	27	24	10
74. cantilever	17	25	21	21	14
75. homiletics	17	36	23	23	11
76. semaphore	16	28	19	16	14
77. Weismannism	15	32	24	23	9
78. Malthus' law	15	40	40	16	5
79. hedonism	14	49	19	20	6
80. amphora	14	36	20	18	8
81. rococo	14	35	26	12	8
82. luff	14	28	16	20	9
83. midiron	14	16	18	15	13
84. f-64	13	15	19	16	12
85. cephalic index	13	34	15	18	7
86. trilobite	13	25	20	10	10
87. amphioxus	12	22	33	18	6
88. pomology	11	20	14	11	9
89. ceramics	10	30	13	10	6
90. chamfer	10	11	14	8	9
91. hemiptera	10	18	16	15	6
92. noi	9	20	3	12	7
93. ageratum	9	14	14	13	6
94. gambit	9	16	7	12	7
95. trephine	9	17	17	8	6
96. intaglio	8	15	9	9	6
97. Braille	7	14	13	7	5
98. impetigo	7	9	5	5	7
99. Elohim	6	13	15	7	3
100. cleistogamous	2	6	4	1	1

so high in the list and hedonism so low is probably merely the reflection of popular usage rather than the result of any study of the history of philosophy. The position of puer shows the influence that Latin still has on the vocabulary of college students, while base-hit reveals the potency of the great American game. In comparison vantage-in, luff and midiron make a very poor showing. Natural selection stands commendably high in view of the low scores received by most biological terms. The score of the freshmen on Euclid shows how little attention is paid in high schools to the historical aspects of geometry. The high score of the sophomores on "simony," and the fact that two sections of freshmen marked it even higher, point to a special explanation of the term by some university instructor. "Kinesthetic" marks the study of psychology by the juniors and seniors, while "kinetic" reaches down to include the sophomores. It is strange that the freshmen are so ignorant of "Polonius," although all have probably read Hamlet in the high school. "Triangulation" indicates the results of the junior work in engineering, and "call-loan" furnishes the freshman an alibi against any charge of high finance. The freshman score on "metacarpal" gives ground for an arraignment of the anatomy and physiology taught in the high school, and "Pestalozzi" testifies to the study of the history of education by seniors. That such terms as "annealed," "scherzo," "cantilever," "trephine," and "Braille" stand so low on the list is somewhat surprising. A similar study of the test on students in other localities would be of interest.

While Whipple and Miss Smith have given us the average scores of students in the different college classes, it was thought that a computation of the range of distribution of individual scores in each class might be of interest. This is presented in Table II in the form of a ten-percentile table of the individual scores. The returns from only 226 freshmen were available for this.

It is doubtful whether this highest freshman score should be allowed to stand, as the next highest score was only 66.0. The fifty-percentile values show a fairly close agreement with the averages given by Whipple and by Smith.

Since it is the purpose of this test to reveal the subject's familiarity with various fields of knowledge, it was thought that it

TABLE II.

	Lowest	10 per cent	20 per cent	30 per cent	40 per cent	50 per cent	60 per cent	70 per cent	80 per cent	90 per cent	Highest
81 Seniors	21.0	36.5	44.0	47.0	49.5	52.5	57.0	58.5	60.5	68.0	78.5
59 Juniors	23.5	34.5	38.0	40.0	41.5	44.0	47.0	49.5	53.5	58.5	69.0
84 Sophomores	16.0	28.0	31.5	35.0	37.0	39.5	44.0	47.0	51.0	59.0	72.0
226 Freshmen	11.5	23.0	26.0	29.0	31.5	33.0	36.0	38.0	42.0	48.0	83.0

would be of interest to combine the terms into rather large groups to see how the classes compared from this point of view. The following more or less arbitrary grouping of the terms was decided on.

1. History and literature (11)

Anthony Wayne	apocalypse	Bernard Shaw
Caedmon	Chartism	dryad
Elohim	Les Miserables	Polonius
synecdoche	Utopia	

2. Language, including musical, social and household terms (11)

aujourd'hui	entree	guimpe
logos	morgen	nada
noi	puer	R. S. V. P.
scherzo	testudo	

3. Philosophy, including education, politics and theology (11)

Braille	cosmogony	golden section
hedonism	homiletics	Pestalozzi
simony	spoils system	stoicism
undistributed middle	Zionism	

4. Physical sciences and mathematics (18)

calorie	cantilever	chlorine
cotangent	electrolysis	eocene
Euclid	gneiss	Kepler's law
kilogram	kinetic	ohm
parallax	peneplain	quadratics
triangulation	trilobite	X-ray

5. Biological sciences (12)

ageratum	amphioxus	Babcock test
chromosome	cleistogamous	hemiptera
infusoria	Malthus' law	mitosis
natural selection	pomology	Weismannism

6. Anatomy, physiology, hygiene and psychology (9)

catalepsy	cephalic index	dietetics
glycogen	impetigo	kinesthetic
metacarpal	pyramidal tract	trephine

7. Arts and manufactures (16)

amphora	annealed	architrave
ceramics	chamfer	dibble
f-64	gasket	hydraulic press
impressionism	intaglio	linotype
Millet	rococo	semaphore
triple expansion		

8. Business (6)

Bokhara	call-loan	clearing house
f. o. b.	tort	way-bill

9. Sports and games (6)

base-hit	gambit	luff
midiron	vantage-in	wigwag

TABLE III.

Scores by Groups of Terms.

	Seniors	Juniors	Sophomores	Freshmen	Total	Per cent of increase
History and literature (11)..	71	61	58	44	52	67
Physical Sciences, etc. (18)..	62	54	53	45	50	34
Business (6).....	61	56	51	42	47	45
Languages, etc. (11).....	55	46	45	36	41	58
Philosophy, etc. (11).....	57	48	45	32	39	75
Sports and games (6).....	45	41	39	32	36	41
Anatomy, etc. (9).....	46	41	32	24	29	92
Arts and Manufactures (16).	42	32	32	26	29	62
Biological sciences (12).....	32	30	24	16	21	100

History and literature stand highest with a total average score of 52, while the biological sciences are lowest with a score of 21. In the last column is given the percentage of increase of the senior over the freshman scores. As was perhaps to be expected, the percentage of increase is highest in the biological sciences, in which the freshmen make the lowest score, and lowest in the physical sciences, in which the freshmen make their best showing. Whether there is any correlation between results in this test and excellence in college work is still to be determined.

APHASIC PERFORMANCE IN THE TERMAN VOCABULARY TEST

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X, a man aged 72, was admitted to hospital care February 16, with history of a mild shock some four months previously, affecting the right side for about two months. Since then he has failed physically and mentally, especially in memory. Sometimes he is clear, then again cannot remember names or recognize persons, is neglectful of business obligations, issues checks irresponsibly, becomes disoriented. Clinically, the case is one of arteriosclerotic psychosis.

Under the Stanford series, March 13–14, the IQ was .57, the only successes recorded above year IX being in vocabulary, backward memory for digits and comprehension. Below this level, a peculiar difficulty appeared in the language tests. In differentiating wood and glass it is replied that "Wood can be ignited and give out heat; glass . . ." (Nothing more elicited) (Stone and egg): "Very little sustenance in a stone; may be sustenance in an egg." (Fly and butterfly): "Why, the construction, the looks . . ." (Cannot be got to specify). It would seem that the difficulty is not one with the objects or task, but in calling up, "propositionizing" the words needed for correct response.

In the Vocabulary test, the unusual feature was noted, that the words missed were scattered fairly evenly throughout the list, instead of being, as normally, heaped up towards the more difficult end. The speech difficulty noted with the other tests appeared to be mainly responsible for this, the words being understood, but impossible to explain. On the next day, March 14,[1] the complete Vocabulary list was repeated by a method of "cued combination," in which a determining cue of the word to be tested is given in a short sentence of appropriate context. Examples are:

The boy was sucking a big ripe or - - - e
A cent is made of co - - - -

[1] The impairment in the patient's memory has been noted. In the tests, he failed at 6 digits (remembered 5 both forward and back), and produced only one "memory" for the fire episode (X 4). He failed on all the X year sentences. The memory of the first test should negligibly affect the results of the second.

The idea is that if the subject "knows" the word he can complete it, but if not, he cannot supply the missing part by guessing. With this method, the patient did very much better, and the failures were more normally distributed. The complete table of performance is as follows:

	By definition, March 13	By combination, March 14
1. orange	+	+
2. bonfire	+	+
3. roar	+	+
4. gown	+	+
5. tap	—	+
6. scorch	+	+
7. puddle	—	+
8. envelope	+	+
9. straw	—	+
10. rule	+	+
11. haste	+	+
12. afloat	+	+
13. eye-lash	+	+
14. copper	+	+
15. health	+	+
16. curse	—	—
17. guitar	+	+
18. mellow	+	—
19. pork	—	+
20. impolite	—	+
21. plumbing	—	—
22. outward	+	+
23. lecture	—	+
24. dungeon	—	+
25. southern	+	+
26. noticeable	+	—
27. muzzle	+	+
28. quake	—	+
29. civil	—	+
30. treasury	—	+
31. reception	+	+
32. ramble	+	+
33. skill	—	+
34. misuse	—	+
35. insure	—	+
36. stave	—	+
37. regard	+	+
38. nerve	—	+
39. crunch	+	+
40. juggler	—	+
41. majesty	—	+
42. brunette	+	+
43. snip	+	+
44. apish	+	—
45. sportive	½	—
46. hysterics	+	+
47. Mars	+	+
48. repose	—	+
49. shrewd	+	+
50. forfeit	—	—
51. peculiarity	—	+
52. coinage	+	—
53. mosaic	—	+
54. bewail	+	+
55. disproportionate	+	—
56. dilapidated	+	+
57. charter	+	+
58. conscientious	+	+
59. avarice	+	+
60. artless	—	—
61. priceless	—	+
62. swaddle	—	—
63. tolerate	—	+
64. gelatinous	+	—
65. depredation	—	+
66. promontory	—	+
67. frustrate	+	+
68. milksop	+	—
69. philanthropy	—	—
70. irony	+	+
71. lotus	+	+
72. drabble	—	—
73. harpy	—	—
74. embody	—	—
75. infuse	+	+
76. flaunt	—	+
77. declivity	+	+
78. fen	—	—
79. ochre	+	+
80. exaltation	+	—
81. incrustation	—	—
82. laity	+	+
83. selectman	+	+
84. sapient	—	—
85. retroactive	—	—
86. achromatic	—	—
87. ambergris	+	+
88. casuistry	—	—
89. paleology	—	—
90. perfunctory	—	—
91. precipitancy	+	+
92. theosophy	—	+
93. piscatorial	+	+
94. sudorific	—	—
95. parterre	—	—
96. homunculus	—	—
97. cameo	+	+
98. shagreen	—	—
99. limpet	—	—
100. complot	—	—

Out of this table result the following figures:

	1–50	51–100	1–100
Total words by cued combination	43	25	68
" " " definition	29	22	51
" " " comb. but not by def.	18	8	26
" " " def. but not by comb.	4	5	9
" " neither by comb. nor def.	3	20	23

On March 16 the patient is described as occasionally disoriented as to time, thinking he has been here two or three months, does not know days of the week, at 2 o'clock will think it is bedtime. At times he does not know the names of the nurses, and forgets simple words, like "collar-button." He was questioned along these lines on March 16, and again, March 19, his abilities at the two interviews comparing as follows:

	March 16	March 19
Knows examiner's name	+	+
Knows approximate date	—	+
Knows name of hospital	—	—
Recognizes name of hospital among others	+	+
Knows approximate time of day	+	—
Knows Governor of Massachusetts	—	—
Knows President and Vice-president	+	+

On March 19 he had looked at the clock and told the time correctly (10.25) at the examiner's entry; seven minutes later he gave the time as "about 11.30; I haven't looked at the clock since 9.30."

He seemed in general a little brighter on this morning, and said himself that he felt so. Certain words with imperfect responses on March 13–14 were repeated, according to groups as below. Each group was first given by cued combination, and then the definition of each word in the group was asked. Except in the column marked with an asterisk, if correct response did not appear in 30 seconds, failure was scored. Prompting or urging were avoided. Grading of definitions was fairly close, minus being recorded for such as, impolite—"a condition one should never take towards a stranger....not polite." Quake —"excited, lose your...." Plumbing—"a condition in which you place certain material in your house, say lead or copper." These insufficient definitions are fair examples of the patient's word-amnesia.

Results for the March 19 observations were as follows:

March 19—Words Known March 13 by Combination but not by Definition

	By comb.	By def.		By comb.	By def.		By comb.	By def.
tap	+	—	treasury	+	—	peculiarity	—	+
puddle	+	+	skill	+	—	mosaic	+	—
straw	+	—	misuse	+	+	priceless	+	+
pork	+	—	insure	+	—	tolerate	+	+
impolite	+	—	stave	—	—	depredation	—	—
lecture	+	—	nerve	+	+	promontary	+	—
quake	+	—	juggler	+	+	flaunt	+	+
civil	+	—	majesty	+	—	theosophy	—	—
			repose	+	+			

Words Known March 13 by Definition but not by Combination

	By comb.	By def.
mellow	—	+
noticeable	—	+
apish	—	—
sportive	—	—
carnage	+	+
disproportionate	—	+
gelatinous	+	+
milksop	—	+
exaltation	—	+

Words Known March 13 neither by Definition nor by Combination

	By comb.*	By def.		By comb.	By def.
curse	—	—	harpy	+	—
plumbing	+	—	embody	+	+
forfeit	+	+	fen	—	—
artless	+	—	incrustation	—	—
swaddle	—	—	sapient	—	—
philanthropy	—	—	perfunctory	—	—
drabble	—	—			

Of these 46 words, 12 are now known both by combination and by definition; 16 others are known by combination but not by definition; 5 others are known by definition but not by combination; and the remaining 13 are known by neither combination nor definition.

The writer has several times given the Vocabulary test, not by calling for definition, but by cued combination as above. The subject is later asked to define any words he has failed to combine, which adds a few words to his score. Most of the words seem harder to combine in this way than to define by Terman's liberal standards, which themselves allow the use of the word in a sentence. But the speech disorder in this patient has left the ability of combination relatively intact, while much disturbing the association between even easy words and other words which describe their meaning.

Defining a word is not a test of "knowing" the word itself, but of knowing its relation to certain other words that describe it. Most people "know" in the sense that they can use, words like *be, and, but, unless,* much better than they can define them. On the other hand, rather unusual words like *noticeable* and

disproportionate are combined with difficulty, but more readily definable owing to their well known bases. *Southern* is a word in Terman's list that suffers in definition, but is readily combined. Some words are more fairly tested by combination, others by definition. For the whole Terman list, the advantage in time lies with procedure by definition. The easier words are somewhat more quickly disposed of by combination, but the harder words much more quickly by definition. The combination method is more adapted to group testing through written papers, tests spelling as well as "knowing" the word, and is somewhat simpler in scoring.

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A study of the progress of 897 white children in three schools of Richmond, Va., grades 1A to 5A; also 787 white children, in ten schools, who were either overage or repeaters. "From the data thus obtained it is evident (1) that many children are misplaced, (2) that mental tests can be employed to determine where they ought to be, and (3) that many of these children can succeed when differently placed."

202. HOLLANDER, B.: *Abnormal Children.*
London: Kegan Paul, Trench, Trubner and Co. 1916, 224 pp.
Explanation of the scale.

203. HOLLINGWORTH, H. L.: *Mentality Tests: A Symposium.* (See later ref.)
Jour. of Educ. Psychol. 1916, 7: 278.
First standardize single tasks, then combine them into duplicate or triplicate sets. More work should be done to determine the practice limits of the various tests.

204. HOLLINGWORTH, L. S.: *The Frequency of Amentia as Related to Sex.*
Reprint from the Med. Record, Oct. 25, 1913. 14 pp.
The Binet scale results indicate, for subjects of the New York Clearing House for Mental Defectives, "that for all mental ages the average actual age at examination is greater for girls than for boys."

205. HOLLINGWORTH, L. S.: *Sex Differences in Mental Tests.*
Psychol. Bull. 1916, 13: 377–384.
Binet scale results included in the review.

206. HYLLA, ERICH: *Meumann's Vorschläge zur Ausgestaltung der Binetschen Intelligenzprüfungs-methode.*
Archiv f. Pädagogik, II Teil, die pädagogische Forschung, 1914, 3: 16–22 (Continued).
A critical review of the second edition of Meumann's "Vorlesungen." (See earlier bibliography, ref. 162.) Points out the lack of sufficient emphasis upon the methodology of the tests.

207. IRWIN, ELISABETH A.: *The Particular Need of Mental Classification in Special Schools.*
Fourth Intern. Congr. on Sch. Hyg., Buffalo, 1913, Vol. III, pp. 569–570.
The scale as an aid toward classification.

208. IRWIN, ELISABETH A.: *Truancy: A Study of the Mental, Physical and Social Factors of the Problem of Non-Attendance at School.*
Public Educ. Assoc., New York City, June, 1915, 66 pp.
Of 150 children absent from school without legitimate excuse, 43% were feeble-minded.

209. IRWIN, ELISABETH A.: *Tests and Methods of Testing.*
Training School Bull. 1916, 13: 120–123.
Some general suggestions and precautions.

210. JAEDERHOLM, G. A.: *Undersökningar över Intelligensmätningarnas Teorioch Praxis.*
Stockholm: Albert Bonniers, 2 Vols. 1914.
One of the most complete studies of intelligence testing, both from a theoretical and practical standpoint.

211. JOHNSON, A.: *The Weakest Children of the Great Mother State.*
Training School Bull. 1915, 12: 135–138.
A brief explanation of the scale.

212. JOHNSON, A.: *Schools and Courts.*
Training School Bull. 1914, 11: 84.
Reports the release from public supervision of 64 feeble-minded children in a New York City school, whose chronological ages had just reached 16, but whose mental ages varied from 5 to 10. The dangers discussed.

213. JONES, C. E.: *A Study of Deviate Children—The Problem of Delinquency and Subnormality.*
Ungraded, 1916, 1: 159–162; also Jour. of Proc. and Add. of thhe 54th Ann. Meetg. of the Nat. Educ. Assoc., New York, 1916, pp. 1058–1060.
A discussion of mental capacity as related to delinquency.

214. JONES, E. E.: *Results of Binet Tests.*
In Proc. of a Confer. on Educat. Measurements, Indiana Univ. Bull., 1914, Vol. XII, No. 10, pp. 51–59.
The history of the scale, its uses and limitations, and a comparison with the Indiana scale for the measurement of intelligence.

215. KELLER, ELEANOR: *Need for Correlation of Binet-Simon Tests with Other Tests of Doing.*
Psychol. Clinic, 1915, 9: 18–22.
The scale fails in the lower and upper range and in application to neuropaths. Emphasizes the superiority of tests of "doing" over tests of "talking."

216. KELLEY, T. L.: *A Simplified Method of Using Scaled Data for Purposes of Testing.*
School and Society, 1916, 4: 34–37, 71–75.
The method of grading, illustrated with a spelling test, could be utilized for the scale. This "would result in a great lessening of the time needed to examine a pupil." The 75% and 50% criteria discussed.

217. KELLEY, T. L.: *Further Logical Aspects of the Binet Scale.*
Psychol. Rev. 1916, 23: 407–411.
A criticism and supplementation of Otis' conclusions. (See later reference.)

218. KELYNACK, T. N.: *Defective Children.*
London: J. Bale, Sons and Danielson. 1915, 462 pp.

219. KENT, GRACE H.: *A Graded Series of Geometrical Puzzles.*
Jour. of Exper. Psychol. 1916, 1: 40–50.
A series of performance tests as supplements to the scale.

220. KENT, GRACE H.: *A Graded Series of Colored Picture Puzzles.*
Jour. of Exper. Psychol. 1916, 1: 242–246.
A second series of "non-verbal" tests for use with the Binet scale.

221. KILPATRICK, W. M.: *The Pintner Tests.*
Jour. of Proc. and Add. of the 54th Ann. Meetg. of the Nat. Educ. Assoc. 1916, pp. 841–842.
A discussion of the relative value of the Binet scale, the form-board tests and substitution tests as measures of the mental ability of the deaf.

222. KITE, ELIZABETH S.: *Responsibility and Crime.*
Jour. of Crimin. Law and Criminol. 1914, 5: 63–73.
A study and interpretation of the later works of Alfred Binet.

223. KITE, ELIZABETH S.: *The Binet-Simon Measuring Scale for Intelligence: What It Is, What It Does, How It Does It. With a Brief Biography of Its Authors, Alfred Binet and Dr. Theodore Simon.*
Printed by the Committee on Provision for the Feeble-minded, Philadelphia, 1916, 29 pp.

224. KITE, ELIZABETH S.: *Binet and Simon: The Intelligence of the Feeble-minded.*
Research Dept., Vineland Training School, 1916, 328 pp.

225. KITE, ELIZABETH S.: *Binet and Simon: The Development of the Intelligence in Children.*
Research Dept., Vineland Training School, 1916, 337 pp.
Complete translations of Binet's contributions to scale testing.

226. KITE, ELIZABETH S.: *The Feeble-Minded Blind.*
Training School Bull. 1916, 13: 135–141.
A revision of the scale for use with the blind.

227. KITSON, H. D.: *Mentality Tests: A Symposium.* (See later reference.)
Jour. of Educ. Psychol. 1916, 7: 279–280.
Intellectual diagnosis presents two phases, quantitative and qualitative. Progress has been made in the former, but practically little has been accomplished in the latter. "We have now evolved a system whereby we can test 100 subjects with a series of sixteen tests, lasting over two hours, distributed over three test periods, and work up the results within two weeks." Advises greater coöperation.

228. KNAPP, P. C.: *Criminal Responsibility.*
Jour. Crim. Law and Criminol. 1915–1916, 6: 571–585.
A discussion of the relation between mental age and responsibility.

229. KNOX, H. A.: *A Scale, Based on the Work at Ellis Island, for Estimating Mental Defect.*
Jour. of Amer. Med. Assoc. 1914, 62: 741–747.

230. KOHN, K.: *Experimentelle Beiträge zum Problem der Intelligenzprüfung.*
Pädagogisch-psychologische Forschungen, 1913, also Lpzg: Quelle und Meyer, 1913, 138 pp.
Among other items of scientific value, the practicability of dissected geometrical forms for intelligence testing discussed.

231. KOHS, S. C.: *The Binet-Simon Measuring Scale for Intelligence: An Annotated Bibliography.*
Jour. of Educ. Psychol. 1914, 5: 215–224, 279–290, 335–346.
254 references, including practically all the literature which had been contributed up to about Jan. 1, 1914. The present supplement includes contributions up to Jan. 1, 1917, about 500 titles, grand total about 750.

232. KOHS, S. C.: *A New Departure in the Treatment of Inmates of Penal Institutions.*
Chicago House of Corr., Psychopathic Dept. Bull. No. 1, July, 1915, 14 pp.
The scale used to assist in classifying and treating convicted individuals.

233. KOHS, S. C.: *The Practicability of the Binet Scale and the Question of the Borderline Case.*

Chicago House of Corr., Psychopathic Dept. Bull. No. 2, Nov., 1915, 23 pp.; also Training School Bull. 1916, 12: 211–224.

An analysis of results obtained from the examination of 335 inmates, ages 17–21. The distributions of the normal and feeble-minded groups overlap. Upper age limit for feeble-minded found to be 11.4, the lower limit for normals found to be 10.6.

234. Kohs, S. C.: *The Binet Test and the Training of Teachers.*
Child Study, 1914, 7: 30–33.
See ref. 140 in earlier bibliography.

235. Kohs, S. C.: *The Borderlines of Mental Deficiency.*
Proc. Nat. Conf. Char. and Corr. 1916, pp. 279–291; also Jour. of Psycho-Asthen. 1916, 20: 88–103.
Among the questions discussed are: Is feeble-minded an arbitrary designation, overlapping of groups and borderlinity. Tentative limits set for the borderzone.

236. Kohs, S. C.: *The Binet Scale and Borderline Cases.*
Training School Bull. 1916, 13: 146–147.

237. Kohs, S. C.: *The Distribution of the Feeble-minded Arranged by Mental Age (Binet).*
Jour. of Delinq. 1916, 1: 61–71.
An attempt to visualize the distribution of mental deficiency tabulated by mental age and interpreted in the light of the Gaussian curve of normal frequency.

238. Kohs, S. C.: *Who Is Feeble-minded?*
Jour. Crim. Law and Criminol. 1915–1916, 6: 860–871; also Ungraded, 1916, 1: 165–171.
A reply to Wallin's assertion that the standard for feeble-mindedness to be valid must not exceed the 10-year intelligence level, perhaps even the nine-year intelligence level. (See later reference.)

239. Kohs, S. C.: *"Who Is Feeble-minded?"—A Rejoinder.*
Jour. Crim. Law and Criminol. 1916, 7: 219–222.
The above discussion continued.

240. Kosog, O.: *Die Wertung der Testserien.*
Zsch. f. angew. Psychol. 1914–1915, 9: 280–298.
A detailed analysis of the responses of his five-year-old son. A discussion of the boy's character, his general reaction time, developmental data, together with an analysis of his replies in each of the tests. Some general conclusions are stated.

241. Kostir, Mary S.: *The Family of Sam Sixty.*
Ohio Bd. of Administratn. Publictn. No. 8, Jan., 1916, 29 pp.
The heredity of Sam, who tested sixty by the Point Scale.

242. Kramer, F.: *Intelligenzprüfungen an abnormen Kindern.*
Monatsschr. f. Psychiatr. u. Neurol. 1913, 33: 500–519.
The application of the scale to exceptional children, between 11 and 16, and to patients in the psychiatric clinic, ages 7 to 13.

243. Kuhlmann, F.: *Feeble-mindedness.*
Psychol. Bull. 1914, 11: 193–202.
An excellent review of the year's literature on the Binet scale in relation to feeble-mindedness.

244. KUHLMANN, F.: *Some Results of Examining a Thousand Public School Children with a Revision of the Binet-Simon Tests of Intelligence by Untrained Examiners. First Article.*

Jour. of Psycho-Asthen. 1914, 18: 150–179.

A clear-cut discussion of the ability of untrained examiners to administer the tests, further improvements which can be made in the scale, and the usefulness of test results to school administrators and teachers.

245. KUHLMANN, F.: *Some Results of Examining a Thousand Public School Children with a Revision of the Binet-Simon Tests of Intelligence by Untrained Examiners. Second Article.*

Jour. of Psycho-Asthen. 1914, 18: 233–269.

A large variety of fundamental questions discussed: the number expected to pass a test for a given age, the assumption of similarity in the number of advanced and retarded, the accuracy of the individual tests, uniformity of tests within the age group, etc.

246. KUHLMANN, F.: *The Mental Examination of Reformatory Cases.*

Jour. of Crim. Law and Criminol. 1914–1915, 5: 666–674.

The scale inadequate for determining the grade of intelligence of the average reformatory case. Intelligence quotient should be used in preference to other methods of determining degree of development.

247. KUHLMANN, F.: *Review: J. E. W. Wallin, The Mental Health of the School Child.*

Jour. of Psycho-Asthen. 1914, 19: 41–48.

A review and criticism of Wallin's conclusions regarding the "present status" of the scale, and the "menace" of amateur testers. (See later and following reference.)

248. KUHLMANN, F.: *Dr. Wallin's Reply to My Review of His "Mental Health of the School Child."*

Jour. of Psycho-Asthen. 1915, 19: 154–170.

249. KUHLMANN, F.: *The Importance and Methods of Determining the Mental Age of Subnormal Children.*

Proc. Wisconsin Teachers Assoc., Milwaukee, Nov. 5–7, 1914, pp. 286–296. Madison, Wis.: Democrat Printing Co., 1915.

Discusses the relative number of subnormal children in the school, their eugenic and educational importance. Gives mental ages of children in first five grades of the Faribault, Minn., schools. Explains the scale and advises its use in every school system.

250. KUHLMANN, F.: *What Constitutes Feeble-mindedness?*

Jour. of Psycho-Asthen. 1915, 19: 214–236.

An attempt to shed light upon a more satisfactory definition of feeble-mindedness. A discussion of current criteria.

251. KUHLMANN, F.: *Part Played by the State Institutions in the Care of the Feeble-minded.*

Jour. of Psycho-Asthen. 1916, 21: 3–24.

A discussion of the distribution of the feeble-minded in society in relation to mental age.

252. KUHLMANN, F.: *Distribution of the Feeble-minded in Society.*

Jour. of Crim. Law and Criminol. 1916, 7: 205–218.

The incidence of feeble-mindedness by mental age.

253. KUHLMANN, F.: *Mentality Tests: A Symposium.* (See later reference.)
Jour. of Educ. Psychol. 1916, 7: 280–282.
The Binet scale is the best we possess. All the American revisions are improvements over the original. "The present danger to the future of psychology in this field lies much more in the psychologist's hostile attitude and destructive criticism of the Binet-Simon tests, which are admittedly imperfect, than it does in the errors in mental diagnosis resulting from their use, even when employed by relatively untrained examiners." Suggests better understanding of the tests. "The 'Point Scale' plan of allowing part credits . . . is wrong in principle when applied to all tests indiscriminately." General character of the tests and procedure for different age-periods must vary.

254. LAZAR, E., UND PETERS, W.: *Rechenbegabung und Rechendefekte bei abnormen Kindern.*
Fortschritte der Psychol. 1915, 3: 167–184.

255. LEWIS, O. F.: *The Feeble-minded Delinquent.*
Jour. of Crim. Law and Criminol. 1912, 3: 10–11.
The utmost care should be exercised in making estimates of feeble-minded among delinquents based on the results of tests.

256. LOBSIEN, M.: *Intelligenzprüfungen auf Grund von Gruppenbeobachtungen.*
Langensalza: Julius Betz, 1915, 59 pp.
Examined 40 pupils in their fourth "Mittelschule" year (chronological ages about 10). Correlation between teachers' estimate and results of tests plus 70%. Gave a number of Binet tests. Grouped his subjects.

257. LODGE, R. C., AND JACKSON, J. L.: *Reproduction of Prose Passages.*
Psychol. Clinic 1916, 10: 128–145.
Criticism of Miss Travis methodology. See later reference.

258. LUNDBERG, E. O., LENROOT, K. F., AND BROWNE, N. B.: *Mental Defectives in the District of Columbia.*
U. S. Dept. of Labor, Children's Bureau Publ. No. 13, 1915, 39 pp.

259. LURTON, F. E.: *A Study of Retarded Children in a Group of Northwestern School Systems.*
Reprint from Vol. 17, Part I, of Trans. Wisconsin Acad. of Sciences, Arts and Letters, 1912, pp. 275–298.
A consideration of the use of the scale for studying retardation.

260. LYMAN, GRACE: *Intelligence Tests in Relation to the Analysis of Intelligence.*
A thesis presented to the Department of Education, Leland Stanford, Jr., Univ., May 6, 1914. 94 pp.
A critique of current definitions of intelligence and an attempt to analyze the psychologic factors involved in the various tests of the scale (Stanford Revision).

261. MCCALLIE, J. M.: *Dangers of Classifying as Feeble-minded Children Who are Merely Backward.*
Proc. Nat. Conf. Char. and Corr. 1916, pp. 257–263; also Jour. of Psycho-Asthen. 1916, 21: 51–57.
Traces the progress through which intelligence diagnosis has passed. A great deal of exact knowledge should precede practice in the use of the scale.

262. MCCORD, C. P.: *One Hundred Female Offenders: A Study of the Mentality of Prostitutes and "Wayward" Girls.*
Jour. Crim. Law and Criminol. 1915–1916, 6: 385–407; also Training School Bull. 1915, 12: 59–67.

Of 50 prostitutes examined (ages 22–41) 46% were of normal intelligence and 54% were feeble-minded. Their reactions are compared with those of 10 teachers of the same sex and age. Of the wayward girls 55% were normal, 45% feeble-minded.

263. MacMurchy, Helen: *Organization and Management of Auxiliary Classes.*
Dept. of Educ., Ontario, Canada. Educ. Pamphl. No. 7, 1915, 212 pp.
The diagnosis of mental defect and the determination of mental age in relation to auxiliary school problems.

264. MacMurchy, Helen: *First Annual Report of the Inspector of Auxiliary Classes of Ontario, 1915.*
Toronto: Wilgress, 1916, 45 pp.
Reviews some of the findings of tests upon delinquents.

265. MacMurchy, Helen: *Feeble-minded in Ontario, 1915.*
Toronto: Wilgress, 1916, 54 pp.
Report of the use of the scale at the institution for the feeble-minded at Waverly, Mass.

266. Manahan, J. L.: *A Bibliography of Educational Surveys and Tests.*
University of Virginia Record, Extension Series, Vol. 2, No. 3, Nov., 1916, pp. 49–92.
Mental tests included.

267. Mangold, G. B.: *Problems of Child Welfare.*
N. Y.: Macmillan, 1914, 522 pp.
A discussion of the results of Binet testing.

268. Martin, A. Leila: *Note on the Training of Teachers to Use the Binet Scale.*
Training School Bull. 1915, 12: 68–69.
A second confirmation of the fact that teachers can be taught to use the scale with surprising accuracy in a six-weeks' thorough summer school course. (See reference 140 in earlier bibliography.)

269. Martin, A. Leila: *Experiments with Binet-Simon Tests upon African Colored Children, Chiefly Kaffirs.*
Training School Bull. 1915, 12: 122–123.
Thirteen cases, ages 4 to 18. Nine children (under eight years chronologically) tested at age, or within one year of it.

270. Martin, A. Leila: *A Contribution to the Standardization of the DeSanctis Tests.*
Training School Bull. 1916, 13: 93–110.
Correlation of Binet age with performance in this test. Concludes that these tests are valuable as a supplementation to the Binet, or for use in a parallel scale.

271. Mastin, J. T.: *The New Colony Plan for the Feeble-minded.*
Proc. Nat. Conf. Char. and Corr. 1916, pp. 239–250; also Jour. of Psycho-Asthen. 1916, 21: 25–35.
The introduction of the Binet tests into this country by Goddard are shown to have initiated a new era in the understanding and treatment of the feeble-minded.

272. Mastin, J. T., Webb, E. E., Ball, E. V., Coghill, H. D., Priddy, A. S., Drewry, W. F., and Hoke, K. J. *Mental Defectives in Virginia.*
Richmond, Va.: Davis Bottom, 1915, 128 pp.

The results obtained from the examination of 743 children in the public schools of Richmond and the provision made for the subnormal in special classes are discussed. See article by Hoke.

273. MAXWELL, W. H.: *A Message.*
Ungraded, 1915, 1: 1–3.
Advises use of the scale by regular class teachers before a child's deficiency is reported to the principal.

274. MELVILLE, N. J.: *An Organized Mental Survey in Philadelphia Special Classes.*
Psychol. Clinic 1916, 9: 258–265.
Examined 850 special class pupils by the 1911 Binet revision. Finds scale of value for grading, and for the study of delinquency and feeble-mindedness.

275. MELVILLE, N. J.: *Further Suggestions Regarding Mentality Tests.*
Jour. of Educ. Psychol. 1916, 7: 429–431.
Outlines what have been the underlying bases for the various criticisms of the scale, and suggests how to eliminate these defects.

276. MENDELSOHN, J. J.: *A Summary of Nervous and Mental Findings in Feeble-minded Children.*
In Health of School Children II, (taken from Illinois Med. Jour., Oct., 1914) Bur. Educ. Bull. No. 50, 1915, pp. 157–161.
295 cases segregated at the Lincoln (Ill.) State School and Colony graded by the scale. Findings: 50 idiots ages 3 to 31; 125 imbeciles ages 6 to 43; 84 morons ages 11 to 48; 24 backward; and 11 normal.

277. *Mentality Tests: A Symposium.* (C. E. SEASHORE, R. M. YERKES, J. R. ANGELL, W. V. BINGHAM, H. H. GODDARD, F. N. FREEMAN, T. H. HAINES, W. HEALY AND A. F. BRONNER, H. L. HOLLINGWORTH, H. D. KITSON, F. KUHLMANN, J. B. MINER, W. H. PYLE, L. M. TERMAN, C. H. TOWN, J. E. W. WALLIN, G. M. WHIPPLE, M. R. TRABUE, N. J. MELVILLE, H. T. WOOLLEY.)
Jour. of Educ. Psychol. 1916, 7: 163–166, 229–240, 278–286, 348–360, 427–433.
For annotations see separate author headings.

278. METTLER, L. H.: *The Diagnosis of the Borderland Psychoses. A Warning.*
Archives of Diagnosis, 1915, 8: 329–339.
Dangers in the use of the scale with borderline subjects.

279. MEUMANN, E.: *Abriss in der experimentellen Pädagogik.*
Lpzg.: Engelmann, 1914, 462 pp.

280. MINER, J. B.: *The Scientific Study of Juvenile Delinquents in Minneapolis.*
Jour. of Crim. Law and Criminol. 1913, 3: 781–783.
An outline of the work and a description of the methods used.

281. MINER, J. B.: *A Percentage Definition of Intellectual Deficiency.*
Paper read before Amer. Psychol. Assoc., Chicago, Dec., 1915.

282. MINER, J. B.: *Mentality Tests: A Symposium.* (See earlier reference.)
Jour. of Educ. Psychol. 1916, 7: 282–284.
In constructing a scale would "prefer to choose tests, the results with each of which could be scored with continuous units." Percentile gradation "should become a fundamental principle in the construction of developmental scales." Variation would then be expressed in percentile terms. Advises construction of supplementary scales.

283. MITCHELL, D.: *Schools and Classes for Exceptional Children.*
Cleveland: Cleveland Foundation, 1916, 122 pp.
In the chapter on the selection of the feeble-minded the following is included: what are the Binet tests, the use of the Binet tests, the use of the tests in Cleveland, who should make the mental tests and the organization of a Division for Examinations.

284. MORGAN, BARBARA SPOFFORD: *The Backward Child.*
N. Y. and London: G. P. Putnam's, 1914, 263 pp.
In outlining a scheme for mental diagnosis it is stated that some of the Binet tests were "selected as bringing into play the mental faculties which must be analyzed."

285. MOULTON, A. B.: *Wassermann Tests: Six Hundred Cases of Feeble-minded at the Minnesota School for Feeble-minded and Colony for Epileptics.*
Jour. of Psycho-Asthen. 1914, 18: 222–226.
The mental ages of the subjects whose reactions were positive, weak positive, very weak positive, or faint or doubtful, are given.

286. NEUSTADT, R. M., AND STATE COMMISSION: *Report of the Commission to Investigate Provision for the Mentally Deficient.*
Albany: J. B. Lyon Co., 1915, 628 pp.
The scale used in various surveys throughout the state.

287. NEWKIRK, H. D.: *On the Diagnosis of Feeble-mindedness.*
Jour. of Crim. Law and Criminol. 1913, 4: 278–280.
The scale should not be used as the sole standard in diagnoses. Dangers of error.

288. OLSON, H.: *The Psychopathic Laboratory Idea.*
Jour. of Crim. Law and Criminol. 1915–1916, 6: 59–64.
The work of the Chicago Municipal Court Laboratory explained, 85% of Boys' Court and Morals Court cases feeble-minded.

289. ORDAHL, GEO.: *A Study of Fifty-three Male Convicts.*
Jour. of Delinq. 1916, 1: 1–21.
Inmates of Joliet penitentiary (Ill.). Range of mental age from 6 to 16. Range of I. Q. from 41–106. Correlations between school grade and mental age. Case studies.

290. ORDAHL, G.: *A Study of 341 Delinquent Boys.*
Jour. of Delinq. 1916, 1: 72–86.
Inmates of the St. Charles School for Boys (Ill.). About 20% feeble-minded. Grades reached, types of delinquency and individual cases discussed.

291. ORDAHL, LOUISE E., AND ORDAHL, G.: *Qualitative Difference Between Levels of Intelligence in Feeble-minded Children.*
J. of Psycho-Asthen. Monogr. Suppl., Vol. I, No. 2, June 1915, 50 pp.
Thirty cases studied, children of mental levels 6, 8, and 10. Chronological ages between 15 and 35. Fifteen tests utilized. Interesting qualitative differences found.

292. OTIS, A. S.: *Some Logical and Mathematical Aspects of the Measurement of Intelligence by the Binet Scale.*
A thesis presented to the Department of Education, Leland Stanford Univ., May, 1915, 57 pp.
Also Psychol. Rev. 1916, 23: 129–152, 165–179.

A masterly discussion of the mathematical and statistical bases underlying the placement of tests in the various ages. Indicates how the final probable intelligence of a child may be predicted on the basis of growth curves, and how a scale may be constructed in which equal increments shall actually measure equal increments in intelligence development.

293. OTIS, A. S.: *Heredity and Mental Defect.*
J. of Delinq. 1916, 1: 87–100, 125–128.
An attempt to reconcile prevailing views regarding the inheritance of mental defect. The nature of intelligence discussed.

294. OTIS, MARGARET: *Moral Imbecility from a Respectable Family.*
Psychol. Clinic 1915, 9: 51–55.
The application of the scale to a girl of "normal intelligence" who is characterized as a "moral imbecile."

295. OTIS, MARGARET: *A Study of Association in Defectives.*
J. of Educ. Psychol. 1915, 6: 271–288.
Correlation of Binet mental age with association responses of defectives and normals.

296. PARKER, SARAH W.: *The Outlook for James: A Clinic Teacher's Report.*
Psychol. Clinic 1916, 10: 71–87.
Analysis of the boy's reactions to the Binet scale.

297. PETERS, A. W., AND BLACKBURN, L.: *Experimental and Clinical Studies on Mental Defectives. I.*
J. of Lab. and Clinical Med. 1915, 1: 180–188.
The use of physio-chemical data in diagnoses to supplement Binet testing.

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EDITORIAL

A STATE BUREAU OF EDUCATIOAL RESEARCH

The New Hampshire state bureau of educational research, established and maintained by the General Education Board, but organized under the administration of the state superintendent of public instruction, has achieved noteworthy results in the hands of its energetic director, Mr. H. A. Brown. These are set forth in the recent annual report of the state superintendent. The general aims of the bureau are the demonstration of the social needs to be met by the school, the formulation of courses to meet these needs, and the development of methods to make the courses effective. Specifically, the bureau has carried on five different lines of investigation:

1. Nearly four thousand pupils were tested for their ability in silent reading, and the results arranged as norms readily used by teachers and superintendents. Striking differences in the reading ability of pupils in the same class were revealed, and the question is raised whether it is not worse than futile to attempt simultaneous instruction with such heterogeneous material. School systems of substantial equality in results differ widely in the amount of time devoted

to reading. Pupils were found in the third and fourth grades with as high reading capacity as pupils in the high school. Such pupils might well be excused from formal work in reading, and encouraged to devote their attention to other subjects in which they are less proficient. It would seem that ability to read is closely related to ability to study, and properly directed and supervised study is likely to enhance reading ability.

2. A beginning was made in the study of the social needs of arithmetic content. This is a large undertaking and will require much time and labor to complete. Perhaps there is no greater service that a state department could render than to make a thorough survey of each section of the state with regard to the resources available for material in arithmetic work. The published results of such a survey would be a mine of information for teachers, would tend to definitize the teaching of arithmetic, and would furnish a basis for determining the arithmetical materials needed in different vocations.

3. An extensive enquiry was made regarding the capacity of pupils to read thought from the Latin page after from one to four years' study of the subject in the high school. There seems to be little improvement after the second year, and ability at the end of the fourth year is meager out of all proportion to the time, energy and money devoted to Latin study and teaching. Pupils who have had little formal instruction in Latin grammar show greater ability to sense the significance of a grammatical construction than those who have had much formal drill in grammar. Latin instruction either has no effect upon or is a positive detriment to the clear, forcible, elegant use of English.

4. A similar study for French is not yet completed.

5. A study of methods in stenography compared the value of the direct method, in which pupils take meaningful notes from the beginning, with that of the formal method, where pupils spend months drilling on symbols before taking any dictation. This is still in progress.

Plans for future prosecution of the work include studies with different types of reading material; a study of transfer in spelling, which will take account of differences in technique of instruction; a study of the effect of different systems of handwriting upon the subsequent, uncontrolled handwriting of the pupils; and the development of a workable scale in English composition. It is to be hoped that the withdrawal of Mr. Brown to normal school work in a distant state will in no way interfere with the realization of these plans.

J. C. B.

NOTES AND NEWS

During the past summer the Food Conservation Bureau of the United States Food Administration in its efforts to get before the people its plans for economizing food stuffs has carried on a campaign of information in the summer schools of the country. A course of ten lessons in conservation was prepared, and 633 schools presented these lessons to their pupils. Over 50,000 copies of the lessons were supplied to teachers' institutes during August and September. The Bureau is now planning with the coöperation of the Bureau of Education to place in the schools a course of study which shall constitute an integral part of our educational aims. The Bureau of Education will publish, on the first of October and of each month thereafter up to June, a bulletin of family and civic economics. The material will be in the form of reading and study courses for elementary and high school grades, and will cover all the topics that enter into community life. These lessons will be prepared under the supervision of Professor Charles H. Judd, of the University of Chicago, and are intended to stimulate closer coöperation between the school and the community in solving the problems of our democracy.

The state health commissioner of Massachusetts has appointed as a committee on the conservation of child life, Drs. David L. Edsall and William J. Gallivan, members of the public health council, and Dr. Lyman A. Jones, director of the division of hygiene of the state health department. As consulting members he has named Drs. Fritz B. Talbot, pediatrist and chief of the children's medical department, Massachusetts General Hospital; Richard M. Smith, assistant in pediatrics, Harvard Medical School; Walter E. Fernald, superintendent of the Massachusetts School for the Feeble-Minded; William Healy, psychopathologist, Boston Juvenile Court; and Miss Mary Beard, director of the Instructive District Nursing Association.—*School and Society.*

The new University High School, maintained in connection with the department of education of the State University of Iowa, has adopted a six-year course of study. Pupils will be admitted who have passed the sixth grade of accredited schools, or who can show an equivalent degree of academic proficiency. The six-year plan was adopted to give greater unity to the work of elementary and secondary education, and to facilitate such arrangements for indi-

vidual instruction as to make it possible for bright pupils to complete the course in five years.

The following communication has been received from the chairman of the committee on examinations of the National Council of Teachers of English: "Though examinations share with text-books the responsibility of determining in very large measure the character of American education, yet little attempt has been made to standardize them. There will be general interest, therefore, in the announcement that a definite and systematic investigation has been authorized by the executive committee of the National Council of Teachers of English to determine the extent that examinations in English set by teachers and various educational authorities are a handicap to the progress of American schools. The committee responsible for this undertaking has prepared to conduct a thoroughgoing inquiry into practices with reference to examinations in English in the elementary schools, the junior and senior high schools, the junior colleges, and in normal schools, colleges and universities. The committee expects to study data obtained from teachers, publishers, and educational authorities, and to test the current practices of examiners in the light of present-day educational needs. A study will be made of the psychological basis of questioning and examining. Considerable thought will be given to the formulation of a philosophy of examining in English studies, and to the determination of definite objectives in testing the results of teaching." The committee bespeaks the interest and co-operation of readers of this JOURNAL. The chairman of the committee is C. C. Certain, Cass Technical High School, Detroit, Michigan.

The Bureau of Educational Experiments has recently issued a pamphlet setting forth the aims of the institution and its accomplishments during the first year of its existence. The Bureau is planned as a clearing house of educational ideas. Its purpose is to collect material that is concerned with the scientific study of education, and by publications and exhibits make it easily available to people who are interested. It gives support to present experiments, initiates new experiments, and endeavors to hasten the introduction of newly acquired methods through actual teaching experiments. Its work is divided into four departments: Department of teaching experiments, department of social, mental and physical experiments, department of information, and department of records and statistics. During the coming year it will undertake several new experimental classes and

through its departments will make an intensive study of all the pupils in these classes from the point of view of their social, mental and physical needs. Through this systematic observing and recording of children it hopes to arrive at a more satisfactory and accurate method of assessing the results of various school environments than has hitherto been possible. The Bureau has at its disposal funds which make possible a program of work extending over a term of years. Anyone desiring a more detailed statement of the aims and publications of the Bureau is invited to write to The Bureau of Educational Experiments, 70 Fifth Avenue, New York, N. Y.

The Milwaukee Teachers Association has sent to the school board a resolution asking for a survey of the Milwaukee schools.—*School and Society.*

The Hicks Series for Atypical Children, published by Milton Bradley Company, 20 Second Street, San Francisco, has been very favorably received in the northwest and on the coast. The series consists of educational games, simple readers, an action primer used as a game, number and geography story books. It is intended to be used with small normal children needing supplementary reading; with over-age, dull, backward and foreign children, whose reading ability does not keep pace with their social understanding; with inattentive and disorderly children, whose interests are manual rather than literary; and with subnormal and feeble-minded children, who fatigue quickly under sustained effort, and who need constant stimulation for any successful effort at all.

Dr. Charles Hughes Johnston, professor of secondary education in the University of Illinois, was killed in an automobile accident between Washington and Baltimore on September 4. Dr. Johnston was born near Chapel Hill, N. C., in December, 1877, and was thus not quite forty years old. Graduating from the University of North Carolina, he entered the Harvard psychological laboratory and carried on an investigation of the feelings under Muensterberg and Holt. In Harvard he also took courses in education, and in his service in the Universities of Michigan, Kansas and Illinois was influential in advancing the cause of psychological studies of educational activities. As editor of two important books on the high school he became identified with secondary education, and as managing editor of *Educational Administration and Supervision* he exerted a stimulating influence upon progressive school men.

Dr. Edward O. Sisson, formerly commissioner of education of Idaho, has accepted the presidency of the University of Montana.—*School and Society.*

Dr. William F. Russell, professor of secondary education at the George Peabody College for Teachers, has been elected dean of the college of education at the University of Iowa.—*School and Society.*

Alfred L. Hall-Quest, professor of secondary education in the University of Virginia, well known for his investigations on supervised study, has been appointed inspector of high schools and dean of the college for teachers at the University of Cincinnati.

Dr. Ernest H. Lindley, professor of psychology at the University of Indiana, known for his work on mental automatisms, psychology of puzzles, arithmetical prodigies, etc., has been called to the presidency of the University of Idaho.

Professor J. O. Creager, dean of the department of education at the University of Wyoming, has been appointed state commissioner of education for Wyoming.—*School and Society.*

At the University of Texas Dr. Clarence S. Yoakum has had his title changed from associate professor of philosophy to associate professor of psychology, and Mr. J. U. Yarbrough has been appointed instructor in psychology.

Dr. H. R. Crosland, of the department of psychology at the University of Minnesota, has been elected assistant professor of psychology in the University of Arkansas.

Dr. Percy Kendall Holmes, of the University of Cincinnati, has been appointed director of physical education in Ohio Wesleyan University.—*Science.*

Dr. C. Truman Gray (Ph.D., Chicago), instructor in the art of teaching at the University of Texas, has been promoted to the rank of adjunct professor in that institution.

PUBLICATIONS RECEIVED

AGNES RUSH BURR. *Russell H. Conwell and His Work.* Philadelphia: The John C. Winston Company, 1917. Pp. 438. $1.35.

The hero of this biography started life as a penniless boy on a rocky New England farm, and became one of the most powerful speakers and most popular pulpit orators in America. Among the interesting episodes are his running away to Europe at the age of fifteen, working his way through Yale College, service in the Civil War, admission to the bar and career as a lawyer, his entrance into the ministry, the building of the Baptist Temple in Philadelphia, the founding of Temple University, and his success on the lecture platform. An appendix contains Dr. Conwell's famous lecture "Acres of Diamonds."

A. D. DARBISHIRE. *An Introduction to a Biology and Other Papers.* New York: Funk and Wagnalls Company, 1917. Pp. xviii, 291. $2.50.

This book contains the fragments of an unpublished book and a number of papers scattered in obscure journals as a sort of memorial to the brilliant young biologist whose life was claimed a few months ago as a sacrifice in the great war. From the preface, written by his sister, we learn that the author began his biological career under the influence of the Biometric School at Oxford and thus took a hostile attitude towards the Mendelian School. Later in his book on "Breeding and the Mendelian Discovery" he endeavors to reconcile these two contending factions by showing that their differences are only apparent. In spite of flattering offers from America and Canada in 1915, he felt it his duty to enlist in the English army, and was carried off by meningitis after an illness of only one day. His philosophical ideas were strongly colored by Bergson, while many passages indicate the powerful influence which music exerted upon his thinking.

ARTHUR W. GILBERT. *The Potato.* New York: The Macmillan Company, 1917. Pp. xii, 318. $1.50.

In these days of war, high cost of living and food famines, it is fitting that the attention of all thoughtful people should be directed to the production of food. The shortage in the last potato crop was keenly felt by the entire civilized world, and all over the country we have seen strenuous efforts made to secure the planting of the largest possible acreage of potatoes. The present work may be considered the official and authoritative account of the ptoato. The author, who is professor of plant breeding at Cornell University, has had the assistance of Professor Mortier F. Barrus, professor of plant pathology at Cornell and of Daniel Dean, formerly president of the New York State Potato Association, in the preparation of the book. Of all the food crops produced in the world, the potato heads the list with

161 million tons; corn comes second with 128 million tons; and wheat third with 106 million tons. Germany raises almost five times as many potatoes as the United States and has considerably over twice as large an average yield per acre. New York surpasses all other states in the production of potatoes but is closely followed by Michigan, Wisconsin and Minnesota. The potato is a native of Peru and Chile but was carried by explorers to Spain in the sixteenth century and thence spread rapidly over all Europe. The subsequent history of the potato forms a very interesting chapter in the world's food production. The book has an excellent discussion of potato breeding, climate, soils, fertilizers, planting, care of the growing crop, protection against insects, potato diseases, harvesting, marketing and storage. It is an invaluable book for potato raisers both amateur and professional.

HERMAN HARRELL HORNE. *Story-Telling, Questioning and Studying, Three School Arts.* New York: The Macmillan Company, 1916. Pp. 181. $1.10.

While we ordinarily associate story-telling with the lower grades, questioning with the class recitation, and studying with more advanced educational work, the author claims that these are universal school arts,—a part of the technique of all teaching craft. They must be adapted to the age and needs of the pupil, and these chapters are designed to point the way to such adaptation. Under story-telling are considered such topics as the importance of the story, the characteristics of a good story, how to tell a story, the reactions of children to stories, and the place of the story in education. There are useful lists of books in which good stories may be found, books on how to tell stories, and lists of stories arranged by grades. The chapters on the art of questioning and the art of studying are written in the easy, informal style which has made the author so popular with groups of teachers.

NELS QUEVLI. *Cell Intelligence.* Minneapolis, Minnesota: The Colwell Press, 1916. Pp. 460. $2.58.

This is a very interesting book, partly because of the wide reading of which it gives evidence, and partly on account of the attitude of the author toward his central thesis. This thesis may perhaps be best expressed in the words of the sub-title, "The Cause of Growth, Heredity and Instinctive Actions, Illustrating that the Cell is a Conscious, Intelligent Being, and, by Reason thereof, Plans and Builds all Plants and Animals in the Same Manner that Man Constructs Houses, Railroads and other Structures." It will be seen that we here have to do with vitalism of an extreme type. The cell is conceived not only as a life principle, but as endowed with the purposeful foresight of a human being. Such a faith would be quite ridiculous (most biologists will probably consider it ridiculous in any case) if it were not for the fact that the author shows considerable

familiarity with and quotes liberally from such standard authorities as Wilson, Haeckel, Jennings, Mast, Driesch, Morgan, Loeb and Verworn. The author is tremendously in earnest and believes that this view of the cell as the source and directive agent of all life activities furnishes a key by which we may read the riddle of the universe. The book is written for the plain man, and the author is endeavoring to give it the widest possible circulation. While we cannot agree in attributing intelligence to single cells, we are convinced that any one who reads the book will have a much better understanding of the way in which animal species are interrelated.

MARY E. RICHMOND. *Social Diagnosis.* New York: Russell Sage Foundation, 1917. Pp. 511.

This is the most elaborate and scientific analysis of the activities of social workers that has yet been published. It is the result of fifteen years' experience in active social work, and has grown up under the stimulus of various courses of lectures delivered to social workers. Part I, on social evidence, deals with the history of social work, the types and uses of social evidence, definitions of certain terms frequently met with, kinds of evidence, and on the significance of inference in social investigation. Part II describes and evaluates the various processes leading to diagnosis. Here we find a careful consideration of the first interview, of the impression produced by the family as a whole, the utilization of outside sources of data, the arguments for and against seeking the help of relatives, the assistance that may be derived from medical examination, the support of teachers, employers, and fellow workers, the use of documentary data, such as directories and newspaper files, neighborhood sources, public officials and fraternal orders, social agencies, letters and telephone messages. Part III gives detailed accounts of the diagnosis and treatment of such special cases as the immigrant family, the deserted or bereft family, the neglected child, the unmarried mother, the homeless and inebriate, the blind, and the feeble-minded. Appendices present samples of first interviews, statistics of outside sources, and a brief working bibliography. All social workers and many teachers would profit by a careful study of this book.

MARY SWARTZ ROSE. *Feeding the Family.* New York: The Macmillan Company, 1917. Pp. xvii, 449. $2.10.

"While many things contribute to health (sleep, fresh air, and exercise, for instance) the foremost consideration is food. This is recognized as never before, and those who regard their own welfare and desire to give their children the best possible equipment for the stress of modern life are asking how to choose food wisely. The purpose of the author has been to provide such a little book for the numerous housewives who prepare something like a thousand meals a year for their families, and who wish to know how the science of nutrition can be made to function most successfully in their daily lives." There are two very sensible chapters on "The Significance

of Food" and "Care of the Digestive Mechanism," followed by specific recommendations in regard to food for the adult man and woman, for the baby, and for children at various ages. The chapters are well written and give a clear account of the food values of different edibles. In an appendix an elaborate table is presented of the nutrition value of different foods and beverages.

WILLIAM BERRYMAN SCOTT. *The Theory of Evolution, with Special Reference to the Evidence Upon Which it is Founded.* New York: The Macmillan Company, 1917. Pp. ix, 183. $1.00.

Intelligent people and even scientists are often confused by the claim that the doctrine of evolution is no longer accepted by the leaders of biological science. Such statements are due to the purposeful or unwitting confusion of Darwinism with evolution, and to the assumption that failure to accept Darwin's views of the potency of natural selection involves the rejection of the whole evolutionary conception. The author shows, however, that never has the general doctrine of evolution been more firmly grounded upon the basis of scientific fact, and more universally accepted by scientific students. In simple, popular language, the author discusses the present status of the question of evolution, and marshals the evidence for the theory derived from embryology, from paleontology, from geographical distribution, and from direct experiment. It is a valuable and convincing book for the intelligent layman and for the young student.

WILLIAM ENGLISH WALLING, and others, Editors. *Socialism of Today.* New York: Henry Holt and Company, 1916. Pp. xvi, 642. $1.60.

In these days of labor unions, of manufacturers' organizations, of coöperative associations for the distribution of farm products, and, of the increasing demands for the public control of public utilities the traditional stigmatism attaching to the term "socialism" is fast disappearing. Everybody seems to be a socialist in some sense, and the chief differences lie in the kind and amount of socialism professed. Under these circumstances the appearance of the present handbook of socialist beliefs is timely. Part I gives a survey and brief history of the socialist parties of the world, beginning with the international socialist movement, and including the chief national movements on the continent, in the United States and Canada, and in the British Empire. It is true that the present war has so profoundly influenced the thought of European socialists that many of the views here expressed could scarcely be said to be representative at the present time. These changes of opinion are discussed in a companion volume, "Socialism and the War." Part II presents the attitude of socialist parties toward such questions as labor unions, the general strike, compulsory arbitration, the cost of living, agriculture and the land problem, government ownership, immigration and the race problem, the drink question, woman suffrage, and education. The book will be found a useful and authoritative compendium of political socialism throughout the world.

CHANG PING WANG. *The General Value of Visual Sense Training in Children.* Educational Psychology Monographs, No. 15. Baltimore: Warwick and York, Inc., 1916. Pp. vii, 85. $1.00.

In view of the extravagant claims recently made in educational literature for the value of visual sense training both in kindergarten and in secondary education the present experimental investigation of the subject on groups of children should attract attention. The subjects were 22 children from nine to twelve years of age, and from grade III, A to V, B. These were divided into two groups of approximately equal ability, one the trained, the other the untrained group. Several of the pupils were obliged to drop out of the experiment before its completion, so that complete records were obtained from only 13 pupils. The training was in the discrimination of the lengths of vertical lines, and was continued for forty-eight periods, extending over fourteen weeks. The results show a slow increase in accuracy of discrimination accompanied by a considerable increase in reaction time. The test experiments included discrimination of pitch, of shades of color and of size. There was no evidence of transfer except in the case of the latter, and here the transfer was greatest when the situation most closely resembled that of the training situation. In another experiment on the marking of letters the improvement consisted in carrying over the methods that had been developed in the training series. On the whole, then, there seemed to be no visual sense training in the process, but some increase of caution in pronouncing judgment, and a considerable transfer of method from one kind of problem to another.

JEAN WEIDENSALL. *The Mentality of the Criminal Woman.* Educational Psychology Monographs, No. 14. Baltimore: Warwick and York, Inc., 1916. Pp. xx, 332.

The essence of the old attitude toward criminals was revenge, that of the new is protection for society. One type of protection is secured by rendering the criminal innocuous, another by changing him into a useful and productive member of society. Either type, but especially the latter, calls for a thorough and intensive study of the criminal, in order to determine the grounds for his anti-social behavior, and thus render possible his re-education and reformation. The new penology, therefore, calls upon the resources of psychology at every step, and is giving rise to psychological studies of law-breakers all over the country. The present study is one of the emost complete and detailed that has yet been made of the criminal woman. The author, who was formerly director of the department of psychology in the laboratory of social hygiene at the Bedford Hills Reformatory, New York, has indicated the scope of the investigation in the subtitle of the book: "A Comparative Study of the Criminal Woman, the Working Girl, and the Efficient Working Woman in a Series of Mental and Physical Tests." The groups tested consisted of 88 inmates of the Bedford Reformatory and eighteen efficient college

maids. The tests used were the Woolley Tests from the Bureau of Vocational Guidance in Cincinnati, supplemented by tests of writing, reading, following directions, mirror tracing, memory, and puzzles. There was thus available for comparison a considerable body of results from the Cincinnati studies. The book presents a mass of valuable material in the form of tables and illustrative charts—material that will repay careful study by all those interested in mental testing. In common with other investigators the author finds this type of criminal woman characterized by a rather low mentality and marked emotional instability.

CLEMENT C. J. WEBB. *Group Theories of Religion and the Religion of the Individual.* New York: The Macmillan Company, 1916. Pp. 208

This is a course of lectures delivered by the author as Wilde Lecturer on Natural and Comparative Religion in the University of Oxford. The author presents in detail his understanding of the sociological theories of religion advocated by a group of prominent French sociologists, and then subjects these theories to a careful and penetrating philosophical analysis. In their emphasis upon religion as a social or group phenomenon the author thinks that these writers (in common with William James and other American students of the subject) have failed to give due weight to the feeling of need on the part of the individual.

JAMES WELTON. *Principles and Methods of Teaching.* Seventh Impression. Baltimore: Warwick and York, Inc., 1916. Pp. xxv, 667. $1.65.

This is an encyclopedic work on methods in teaching. After introductory chapters on the functions of the teacher, the material of instruction, and the form of instruction, there follow chapters on such specific subjects as the teaching of reading, literature, composition, grammar, music, history, geography, science, mathematics, manual training, and needle work. There is an appendix of 100 pages on the teaching of modern languages.

CLIFFORD WOODY. *Measurements of Some Achievements in Arithmetic.* Teachers College Contributions to Education, No. 80. New York: Teachers College, Columbia University, 1916. Pp. 63. $1.00.

"The purpose of this monograph is to set forth the results of an attempt to derive a series of scales in the fundamental operations of arithmetic. Each of the scales is composed of as great a variety of problems as the fundamental operations can well permit. These problems, beginning with the easiest that can be found, gradually increase in difficulty until the last ones in each series are so difficult that only a relatively small percentage of the pupils in the eighth grade are able to solve them correctly. In the determination of the relative difficulty of these problems, the relative per cents of correct answers obtained by submitting them to large numbers of school children were taken as a basis."